MINUTES

6th Meeting of Academic Council

(August 4, 2012)

SHARDA UNIVERSITY

GREATER NOIDA, U.P

SHARDA UNIVERSITY

32, 34, Knowledge Park-III, Greater Noida (UP)

Minutes of the 6th meeting of the Academic Council held on August 4, 2012 at 11:00 a.m. in Board Room, School of Business Studies of the University.

The following were present:

1.	Prof. J. P. Gupta, Vice Chancellor	-	In the Chair
2.	Prof. M. P. Jain, Dean, SET		
3.	Prof. R. K. Verma, Dean, SBS		
4.	Dr. Prathibha Gupta, Dean, SMS&R		
5.	Prof. Jagadeesh H. G, Dean, SDS		
6.	Dr. K. K. Sharma, Dean (officiating), SAHS		
7.	Prof. Jaideep Chatterjee, Dean, SAP and SADMS		
8.	Prof. O. P. Bajpai, Director, Academic Affairs		
9.	Dr. S. K. Mishra, Director, RTDC		
10.	Prof. A. K. Soni, Professor, SET		
11.	Prof. Yogesh Chander, Vice Principal, SMS&R		
12.	Dr. Renuka Jagdish Bathi, SDS		
13.	Prof. K. N. Gupta		
14.	Prof. S. K. Khanna, Chief Advisor (special invitee)		
15.	Dr. Ranvir Singh, Dean, Students' Welfare (special invitee)		
16.	Prof. R. C. Maheshwari (special invitee)		
17.	Prof. Om Kumar Harsh (special invitee)		
18.	Prof. Bharat B. Gupta (special invitee)		
19.	Prof. Jaydev Sharma (special invitee)		
20.	Prof. H. K. Verma (special invitee)		
21.	Sh. Avais Ahmad, Registrar	-	Secretary

Prof. Padam Kumar, Prof. Ajay Pandit and Prof. Shalini Sharma regretted their inability to attend the meeting. Mr. Mukesh Aghi and Dr. Santanu Chaudhury could not attend the meeting.

The Vice Chancellor welcomed the members to the 6th meeting of the Academic Council. The new members / special invitees were introduced to the Academic Council:

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- **Prof. J. P. Gupta, Vice Chancellor**

  Prof. J. P Gupta obtained B. Sc (Engg.) from BHU in 1971, M. E. from University of Roorkee (now IIT Roorkee) in 1973 and Ph. D in Computer Engineering from University of Westminster, London (UK) in 1985. He joined Sharda University in February 2012.

  Prof. Gupta joined University of Roorkee (UOR) in 1974 and became Professor in 1989. At University of Roorkee, he was engaged in teaching, research and administration. On deputation from University of Roorkee, he served as the First Full-time Member Secretary of All India Council for technical Education (AICTE) from 1994 to 1998. He also worked as Professor and Dean at Indian Institute of Information Technology and Management (IIITM), Gwalior (Government of India Institution).

  In the year 2000 Prof. Gupta joined Jaypee Group to set up Jaypee Institute of Information Technology (JIIT), Noida (UP). He served as the Founder Director and was its first Vice Chancellor on the Institute becoming Deemed to be University declared by Ministry of Human Resource Development (MHRD), Government of India. Prof. Gupta has been instrumental in giving major thrust to the growing dimensions of JIIT to become premier Institute imparting Technical Education.

  Prof. Gupta has teaching, research and administrative experience of over 37 years. He has supervised 15 Ph. D theses and published more than 75 research papers in International Journals and Conferences. His research interests include Parallel Computing, Image Processing, Search Engines and Software Engineering. He has been IT consultant to a large number of organizations and has completed several R&D and Consultancy projects funded by Government Organizations and Indian Industries.

- **Prof. S. K. Khanna, Chief Advisor**

  Prof. Khanna is the former Chairman, All India Council for Technical Education (AICTE) and Vice Chairman, University Grants Commission (UGC). He was Chairman of Board of Governors, Indian Institute of Management (IIM) Ahmedabad. Prof. Khanna has teaching and research experience of 26 years at University of Roorkee (IIT-Roorkee). Prof. Khanna has supervised 22 Ph.D. scholars and has published 257 research papers. He has authored technical books which are being referred for almost three decades by students and professionals engaged in Highway, Transportation Planning and Infrastructure Design. Prof. Khanna is Fellow, Indian National Academy of Engineering (FNAE) and Fellow, Indian National Academy of Sciences (FNASc). For his contributions, the University of Roorkee (IIT) and several other prestigious Universities have honored him with Doctor of Engineering/Science Degrees (Honoris Causa).

  Prof. Khanna is currently Chairman, (GB), INFLIBNET (UGC), Ahmedabad and Chairman (BOG), School of Planning & Architecure, Vijaywada, AP (GoI MHRD).

Avais Ahmad.

- **Dr. Ranvir Singh, Professor Emeritus / Dean Students Welfare**Dr. Singh has graduated in Agriculture Engineering and thereafter did his Masters in Soil and water conservative engineering and later obtained his Doctorate of Philosophy (Water Resources Systems Engineering) from IIT Delhi, India. In addition to this Dr. Singh has done UNDP Advance Training in Watershed Management from University of Arizon,, USA.

  He has extensive experience into Teaching and University administration. Dr. Singh has been the Dean of student's welfare, University of Rorkee.
  Dr. Singh has published 7 books in the areas of Agriculture Hydrology; 50 technical papers presented / published in various International and National Journals and supervised 9 Ph.D thesis & 44 M.E. Dissertations.

- **Prof. Padam Kumar**, Department of Electronics & Computer Engineering, IIT-Roorkee
  Areas of Interest: Parallel Processing, Parallel Algorithms, Multiprocessor Networks, Functional Programming, Microprocessor Based Systems.

  Born on September 7th, 1949, Dr. Kumar did his B.Tech. (Electrical Engg.) and M.Tech. (Radar Systems) from IIT Delhi, in 1970 and 1972, respectively. Thereafter he served Defense Electronics Research Lab, Hyderabad as Senior Scientific Officer for a period of 2 years and joined department of Electronics and Computer Engineering in November 1974 as Lecturer. Later he diversified himself into Computer Science area and did his Ph.D. in the use of Functional Programming Languages in Multiprocessing Systems. Currently he is Professor of Computer Science with research interests in Parallel Processing, Multiprocessor Networks, Load Balancing and Scheduling, and Real Time Systems.

  Dr. Kumar has visited/presented papers at several conferences abroad. He has been to University of Westminster, UK on a British Council Post Doctoral Fellowship and once more under ALICE programme. He has guided 2 Ph.D's (three students are currently working), besides about 30 M.Tech. dissertations.

- **Dr. Mukesh Aghi** is the Chairman and CEO, Steria (India) and is responsible for the overall Indian operations and strategy. In addition to this role, Dr. Aghi is also a member of Steria's 'Operational Board' and 'Executive Committee'. With over 22 years of experience across diverse industries and geographies, he has a proven track record of leading various international business giants including Universitas 21 Global, IBM Corporation, Ariba Inc, to name a few. His expertise spans across - management of global consumer and corporate strategies; building and maintaining talents across geographies; profitable turnaround of operations through effective business strategies; management of global JVs and alliances and building strong leadership teams. Prior to joining Steria (India), he was with Universitas 21 Global for five years as their CEO. Dr. Aghi has also played many key roles in IBM Corporation, Ariba, Inc and J.D.Edwards & Co. An MBA from Andrews University. Dr. Aghi holds a Doctorate in International Relations from Claremont Graduate School and an Advanced Management Diploma from Harvard Business School. Dr. Aghi is also a member of Prime Ministers' IT Task Force (India) and has won prestigious leadership awards including - Asian Leader Award and JRD Tata Leadership Award.

Avais Ahmad

- **Prof. R. C. Maheshwari**, Advisor Corporate R&D, SGI
  Prof. R.C. Maheshwari is the Advisor Corporate R&D of Sharda Group of Institutions and was also a former Director of H.C.S.T. and professor at Indian Institute of Technology, New Delhi. He did his Ph.D. from I.I.T., Delhi in 1974 and a post doctoral research at the Technical University, Karlsruhe, Germany in 1975-76 under the DAAD programme. He involves deeply in teaching, research for the last 37 years in the areas of natural products, Bio energy systems, waste management, drinking water and technology transfer. Prof.Maheshwari is an expert in the field of liquid/Supercritical Fluid Extraction and Separation Technology. He has operated several research and industrial projects of diverse nature in the field of medicinal and aromatic plants, renewable energy and SCFE Technology. He has been actively associated with extraction, processing and characterization of phytochemicals. He has guided over 20 M.Tech and 26 Ph.D. students. He has to his credit 4 patents and over 170 research papers published in various Indian and International journals of repute and have also authored number of books. He was awarded Dr.Rajendra Prasad award for writing best technical book in Hindi in the year 2008. He was on the editorial board of many scientific journals. He was an active member of many national and international professional committees.

- **Prof. Om Kumar Harsh** Director, Hindustan College of Science & Technology, Mathura
  Dr. Om Kumar Harsh possesses three research degrees, namely Ph.D, D.Sc. (Physics) and Master of Electronics Engineering by research from Australia. He also has three Masters Degrees in Physics, Engineering (Australia by research as mentioned) and Computer Science (Australia). He also holds a post graduate diploma in Instrumentation from Australia. In addition, Dr. Harsh has also guided half a dozen Ph. D. students and published or presented around eighty (80) research papers in journals or conferences of International reputation in the field of Solid State Plasma Physics, Software Engineering, Distance Education and Knowledge Management. He is likely to receive one more doctoral degree in Information Systems from the Australia.

  Dr. Harsh has an academic career of working as an academician in all the three fields of Physics, Engineering and Computer Science. He has done his research work with five internationally recognized scientists including Professor K.S. Srivastava (Ex-professor, Lucknow University), Late Professor R.N. Singh (Ex-Director, IT, BHU), Late Professor B.K.Agarwal (Ex-Head Physics of Allahabad University), Professor Martin Green (Director of Special Research Centre, University of New South Wales, Sydney) and Professor A.S.M. Sajeev (Head of Computer Science/IT, University of New England, Australia)

  Research papers of Dr. Harsh have widely referred across Europe and American continents. Eminent International Scientist and late Professor B.K. Agarwal of Allahabad University (who was the research adviser of Dr Harsh) have cited his important research papers in his book published from Springer-varlog (West Germany).

  Dr. Harsh has served at Kanpur University, Monash University, University of South Australia, and Charles Sturt University Campus. He also served for short term at University of New England, Australia. He has also been selected to work as a Professor & Dean at a US institute (Champlain College) in Dubai, where he worked from 2003 to 2005. Dr. Harsh also has industrial experience in Australia e.g. at Compaq Computers and TL Cousine (Sydney).

- **Prof. Bharat B Gupta,** Distinguished Professor- Mechanical Engineering

  Prof Gupta has graduated in Mechanical Engineering (Hons.) in 1967 and thereafter did his Masters Mechanical Engineering (Hons.) in 1972 from A.M.U. Aligarh, and later obtained his Doctorate of Philosophy (Applied Mechanics) from Indian Institute of Technology Delhi, India. In addition to this Prof. Gupta has done HDR (Habilitation à Diriger des Recherches - 1989) from University of Paris XII France.

  He has 44 years of experience into Teaching and 40 years of experience into Research. Dr. Gupta was also responsible of different administrative posts at UTC and UFC.

  He was deputed to Indian Institute of Technology Delhi, India by the Ministry of Education, France for 3 years, 2001-2004, worked as chair professor and responsible of Indo-French project "IFUWWT" (Indo-French Unit for Water and Waste Technologies) in the Civil Engineering Department of IIT New Delhi, India.

  He guides research work of doctoral students in the field of Membrane Processes and its applications to biomedical, food industry, water and wastewater treatment. He has published more than 135 research papers and has prepared more than 30 international research reports. He has a patent on the application of pulsating flow in membrane processes. He is member of different international societies, ESAO, ISAO, SFT, EMS, GFGP, IMS, CFM and IWRA.

- **Dr. Jaydev Sharma,** Distinguished Professor- Electrical Engineering

  Dr. Sharma has graduated in Electrical Engineering and thereafter did his Masters in Power System from University of Roorkee and later obtained his Doctorate of Philosophy (Electrical Engineering) from University of Roorkee, India.

  He has extensive experience into Teaching and University administration. Dr. Sharma has been the Director (Actg), IIT, Roorkee, University of Roorkee.

  Dr. Verma has published 115 National and International Research papers; has published 95 Technical Reports in National and International Conferences; and supervised 36 Ph.D thesis & 79 M.E / M.Tech Dissertations. He has also undertaken 81 projects.

- **Dr. H.K Verma,** Distinguished Professor- Electrical Engineering

  Dr. Verma has graduated in Electrical Engineering and thereafter did his Masters in Electrical Engineering (Hons.) from University of Roorkee and later obtained his Doctorate of Philosophy (Protection/static Protective Relays) from University of Roorkee, India.

  He has extensive experience into Teaching and University administration. Dr. Verma has been the Director, IIT, Roorkee, University of Roorkee.

  Dr. Verma has published 198 Research papers in Journals / Conferences; 148 Technical Reports and supervised 14 Ph.D thesis & 120 M.E / M.Tech Dissertations.

The Council, thereafter, took up the regular agenda items:

Item No. 6.1: To confirm the minutes of the 5th meeting of the Academic council held on December 17, 2011.

The Council was informed that no comment has been received from any of the members of the Academic Council. Thereafter, the Council resolved to approve the minutes of its 5th meeting as circulated.

Item No. 6.2: To approve the Action Taken on the minutes of the 4th meeting of Academic Council held on July 19, 2011.

The Council resolved to approve the Action Taken Report as presented with the Agenda.

Item No. 6.3: : To ratify the action taken by the University on matters of urgent nature;

The Council ratified the following actions taken by the University on matters of urgent nature as circulated with the Agenda:

a. Academic Calendar 2012-13; (MBBS/BDS/MDS/MBA (Trimester) programmes not included)

b. Academic Calendar for Trimester based MBA programme of School of Business Studies for the session 2012-13;

c. Academic Calendar for School of Medical Sciences & Research:

d. Recommendations of Admission Committee on eligibility criteria for admission to various programmes offered by the University as placed before the Council vide **Annexure-I**.

e. Intake capacity for various programmes of studies as placed before the Council vide **Annexure-I**.

f. The Dates of Commencement and Conclusion of Admission process 2012-13.

g. Fees to be charged from students admitted to various programmes offered by the University as placed before the Council vide **Annexure-II**.

h. Fees to be charged for various categories of Hostel Accommodation (food included) in the year 2012-13 as placed before the Council vide **Annexure-II**.

i. Scholarship Policy as placed before the Council vide **Annexure-II**.

j. Creation of School of Design and merger of School of Allied Sciences and Creative Arts with the new school and its renaming as School of Arts, Design and Media Studies;

k. Establishment of School of Nursing;

l. Establishment of School of Engineering;

m. Dental Council of India (DCI) approval for the Post Graduate programmes offered by School of Dental Sciences from the Academic Year 2012-13;

n. Application for issuance of 'Letter of Permission' to start Post Graduate courses at School of Medical Sciences & Research;

Iraiz Ahmad.

o. Lateral entry to the M.Sc. Clinical Research for the students who have completed one year PGDCR programme at School of Allied Health Sciences;

p. Relaxations given to the students who did not fulfill the mandatory requirement of attendance for appearing in the End-Term Examination issued vide Notification no. SU/Reg./Notification/2012/070 dated, May 2, 2012 and placed before the Council vide **Annexure-III**.

q. Clarifications with regard to Registration for Summer Term-2011-12 issued vide Circular no. SU/Reg./Circular /2012/004 dated June 6, 2012 and placed before the Council vide **Annexure-IV**.

r. Commencement of new session of B.Sc. Nursing and GNM programmes offered by School of Nursing;

Item No.6.4 To approve the Course Structure and Credit Distribution of the 5 years Bachelor of Architecture (B.Arch.) programme offered by School of Architecture & Planning;

The Council was informed that the School of Architecture & Planning, established in 2011-12, has formulated detailed course structure and credit distribution for the Bachelor of Architecture (B.Arch.) programmes offered by the school. The Dean of the school apprised the members of the salient features of the programme. The Council deliberated the matter and resolved to approve the Course Structure, Syllabi and Credit Distribution of the 5 year B.Arch. programme as placed before the Council vide **Annexure V-B**.

Item No.6.5: To consider a proposal received from the Dean, School of Architecture & Planning to start a Post Graduate programme; Masters in Habitat Studies form the Academic Year 2012-13 and to approve the Course Structure and Credit Distribution associated with the programme.

The Council discussed the proposal received from the School of Architecture & Planning and approved the Masters in Habitat Studies programme to be offered from the Academic Year 2012-13 together with the detailed Course Structure, Syllabi and Credit Distribution as placed before the Council vide **Annexure-VI-B**.

The Council also resolved that the students on successful completion of one year of the Masters in Habitat Studies programme, may be allowed to exit with a Post Graduate Diploma in Habitat Studies.

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Item No.6.6: To consider a proposal received from the Dean, School of Arts, Design & Media Studies (SADMS) to start 4 years Bachelor of Design (B.Des.) and 2 years Master of Design (M.Des) programmes from the Academic Year 2012-13 together with the Course Structure and Credit Distribution.

The proposal received from the School of Arts, Design & Media Studies was discussed in detail. The Council approved the proposal to start 4 year Bachelor of Design (B.Des.) and 2 year Master of Design (M.Des.) programmes from the Academic Year 2012-13 together with Course Structure, Syllabi and Credit Distribution as placed before the Council vide **Annexure-VII-B&C** respectively.

Item No.6.7: To consider revised Course Structure and Credit Distribution for Bachelor of Journalism and Mass Communication and Master of Journalism and Mass Communication programmes to be offered by School of Arts, Design and Media Studies from the academic year 2012-13;

The Council was informed that the curriculum of the on-going Bachelor of Journalism and Mass Communication (BJMC) and Master of Journalism and Mass Communication (MJMC) has been revised with an aim to provide strong grounding to the students in the field of Media Studies through competence development in Audio-Visual Communication, Advertising, Development Communication and Public Relations. The Council deliberated in detail the proposal received from the School and resolved to approve the revised Course Structure and Credit Distribution of BJMC and MJMC programmes for the students admitted from the Academic Year 2012-13, as placed before the Council vide **Annexure-VIII-C** & **D** respectively.

Item No.6.8: To consider the proposal received from the Dean, School of Arts, Design and Media Studies to start Post Graduate Diploma programmes in (i) 'Advertising and Public Relations' and (ii) in 'Development Communications';

The Council was informed that keeping in view the demand from industry, the School has planned to start two new diploma programmes in (i) 'Advertising and Public Relations' and (ii) 'Development Communications'. The PG Diploma offered by the School in PR, Advertising and Event Management has not been very popular with the industry, therefore, the school has proposed its discontinuation. The Council after discussing the matter approved to starting PG diploma in (i) 'Advertising and Public Relations' and (ii) 'Development Communications' from the Academic Year 2012-13, together with Course Structure, Syllabi and Credit Distribution as placed before the Council vide **Annexure-IX-C** & **D** respectively.

The Council also approved discontinuation of PG Diploma in PR, Advertising and Event Management from the Academic Year 2012-13.

Anais Ahmad

Item No.6.9: To consider the course details and credit distribution for the Bachelor of Computer Applications (BCA) International offered by department of Computer Sciences, School of Engineering & Technology;

The Council discussed the proposal received from School of Engineering & Technology. The Council decided to change the name of the programme from BCA International as proposed by the School to BCA programme with specialization in Animation; Software Engineering; E-Commerce and E-Governance respectively. The Council also approved the Course Structure, Syllabi and Credit Distribution for BCA with specialization in Animation and BCA with specialization in Software Engineering as placed before the Council vide **Annexure-X**.

Item No.6.10: To consider the recommendations of the committee constituted to propose amendments in the Ph.D. regulations and recommend to the Executive Council the approval of the Doctor of Philosophy (Ph.D.) Ordinances 2012;

The Council noted the item by item comparison together with its justification prepared by the Committee. The Council also discussed in detail the draft Ph.D. Ordinance 2012 and resolved to recommend to the Executive Council the approval of the Ordinance as placed before the Council vide **Annexure-XI-B**.

Item No.6.11: To consider draft Ordinance governing Master of Technology (M.Tech.) and Bachelor of Technology (B.Tech.) programmes offered by the School of Engineering & Technology and to recommend to the Executive Council for its approval;

The Council deliberated the two draft Ordinances in detail. The Council authorized the Vice Chancellor to review the issue of Grading System to be adopted for the Academic Session 2012-13 for the approval of the Executive Council.

With modification as above, the Council resolved to recommend to the Executive Council the approval of M.Tech. and B.Tech. Ordinance 2012 as placed before the Council vide **Annexure-XII-A** & **B** respectively.

Item No.6.12: To consider a proposal received from School of Business Studies on BBA program together with Course Structure and Credit distribution, proposed to be offered from the Academic Session 2012-13;

The Dean of the School presented the main features of the BBA programme proposed to be offered by the school from Academic Year 2012-13 and resolved to approve the revised Course Structure and Credit Distribution for the BBA programme as placed before the Council vide **Annexure-XIII**.

Item No. 6.13: To consider a proposal received from School of Business Studies for starting additional Trimester based MBA programmes together with the Course Structure and Credit distribution, proposed to be offered from the Academic Year 2012-13;

The Council after deliberating in detail the proposal received from the School of Business Studies resolved to approve starting additional Trimester based MBA programmes together with their Course Structure and Credit distribution as placed before the Council vide **Annexure-XIV-A, B, C, D** & **E** respectively in the following specialization:

1. Master of Business Administration - Banking and Finance
2. Master of Business Administration - Retail Management
3. Master of Business Administration - Consulting Services
4. Master of Business Administration - Security and Intelligence Management

The Council was of the view that in order to make the proposal economically viable, the school should take necessary steps so that atleast 20 students are admitted to each of these specialized MBA programmes.

Item No.6.14: To consider a proposal received from School of Business Studies for starting Executive MBA programme together with the Course Structure and Credit distribution, proposed to be offered from the Academic Year 2012-13;

The Council resolved to approve the proposal received from the School of Business Studies for starting Executive MBA programme together with the Course Structure and Credit Distribution as placed before the Council vide **Annexure-XV**.

Anis Ahmad

Item No.6.15: To consider a proposal received from School of Business Studies to start BA (Hons.) - Applied Economics programme together with the Course Structure and Credit distribution, proposed to be offered from the Academic Year 2012-13;

The consideration of this item was withdrawn. A fresh proposal may be submitted for consideration of Academic Council when the School of Humanities is established.

Item No. 6.16: To consider recommendations of the Committee constituted to examine equivalence of the work done by the Chinese students at the Chinese University to the first year BBA programme of Sharda University;

The Council considered the recommendations of the Committee constituted to examine equivalence of the work done by the Chinese students at the Chinese University to the first year BBA programme of Sharda University and resolved to approve the recommendations of the Committee as placed before the Council vide **Annexure-XVII**.

Item No. 6.17: To consider a proposal received from Dean, School of Allied Health Sciences for starting a 3 year B.Sc. Medical Imaging Technology (B.Sc. MIT-Radiography) programme from the Academic Year 2013-14;

The Council considered the proposal received from the School of Allied Health Sciences and resolved to approve starting 3 year B.Sc. Medical Imaging Technology (B.Sc. MIT-Radiography) programme from the Academic Year 2013-14 together with Course Structure and Scheme of Evaluation as placed before the Council vide **Annexure-XVIII**.

Item No. 6.18: To approve the Course Structure and Scheme of Evaluation of B.Sc. Medical Laboratory Technology (B.Sc. MLT) programme;

The Council resolved to approve the Course Structure and Scheme of Evaluation of B.Sc. Medical Laboratory Technology (B.Sc. MLT) programme as placed before the Council vide **Annexure-XIX**.

Item No. 6.19: To consider revision of Course Structure and Scheme of Evaluation for M.Sc. Clinical Research programme and Post Graduate Diploma in Clinical Research;

The Council considered the proposal received from School of Allied Health Sciences and resolved to approve the revised Course Structure and Scheme of Evaluation for M.Sc. Clinical Research and Post Graduate Diploma in Clinical Research offered by the School as placed before the Council vide **Annexure-XX**.

Avais Ahmad

Item No. 6.20: ***To consider the revised recommendations of the committee constituted by the Academic Council on question of Credit Transfer;***

The Council considered the revised recommendations of the Committee constituted by it on question of Credit Transfer and resolved to recommend to the Executive Council the approval of the 'Credit Transfer Policy' as placed before the Academic Council vide **Annexure-XXI**.

Item No. 6.21: ***To approve the Syllabi of the ongoing B.Tech. programme offered by the School of Engineering & Technology for the students admitted prior to Academic Year 2012-13; for (i) Term VII and Term VIII, 4th year for all the departments other than B.Tech. (Biotechnology) and B.Tech. (Automobile Engineering), (ii) Term V onwards for B.Tech. (Automobile Engineering) and (iii) Term III onwards for B.Tech. (Biotechnology);***

The Council discussed the proposal received from the School of Engineering & Technology and resolved to approve the revised syllabi of the B.Tech. programmes offered by School of Engineering and Technology for the students admitted prior to Academic Year 2012-13 as placed before the Council vide **Annexure-XXII A, B** & **C**, respectively.

Item No. 6.22: ***To approve the revised Course Structure, Syllabi and Credit Distribution for first year, Semester I and Semester II and the Course Structure and Credit Distribution for Semester III onwards of the B.Tech. programme for the students admitted to Academic Year 2012-13 and onwards;***

The Council discussed the proposal received from the School of Engineering & Technology and resolved to approve the revised Course Structure, Syllabi and Credit Distribution of the B.Tech. first year, semester I and II and the Course Structure and Credit Distribution for Semester III onwards of the B.Tech. programme offered by School of Engineering and Technology for the students admitted in Academic Year 2012-13 and onwards as placed before the Council vide **Annexure-XXIII-B** & **C**, respectively.

Item No. 6.23: ***To consider revised Course Structure, Syllabi and Credit Distribution for M.Tech., BCA, MCA and M.Sc. Biotechnology programmes offered by School of Engineering & Technology;***

The Council considered the proposal and resolved to approve the revised Course Structure, Syllabi and Credit Distribution for M.Tech., BCA, MCA and M.Sc. Biotechnology programmes offered by School of Engineering & Technology as placed before the Council vide **Annexure-XXIV-B**.

Avais Ahmed

Items Placed on table:

Item No. 6.24 ***To consider the Rules, Regulations and Guidelines of examination for BBA and B.Com (Professional) programmes offered by School of Business Studies;***

The Council considered the Rules, Regulations and Guidelines of examination for BBA and B.Com (Professional) programmes offered by School of Business Studies and resolved to approve the same as detailed at **Annexure-XXV**.

Item No. 6.25 ***To consider the Course Structure of certificate courses in French and German and B.A (Honours) English programme proposed to be offered by the School of Languages for the students admitted in Academic Year 2012-13 and onwards;***

The Council considered a proposal received from School of Languages and approved the Course Structure and Syllabi of the Certificate courses in French and German and B.A. (Honours) English programme to be offered by School of Languages for the students admitted in Academic Year 2012-13 and onwards and as placed before the Council vide **Annexure-XXVI**.

Item No. 6.26 ***Any other Item:***

The Vice Chancellor shared with the members the dilemma faced by University in faculty recruitment. The University with an aim of becoming a Global Centre of Learning desires that Assistant Professors appointed by University specially in School of Engineering & Technology and School of Business Studies should posses a Ph.D. degree. The University at present appoints fresh M.Tech. and MBA degree holders with 60% marks or equivalent grade as Assistant Professors, as per criteria laid down by the University Grants Commission (UGC). These fresh recruited teachers are at times found wanting in discharge of their duties as they do not have any teaching experience.

The Council was also apprised that the University in order to encourage its faculty members to enhance their qualification has decided that the faculty members admitted in Ph.D. programme will not be charged any fee. The Council appreciated the efforts of the University and after deliberating in detail suggested following course of action:

1. The fresh M.Tech. and MBA's with first division or equivalent grade may not be recruited as Assistant Professors directly. They may instead be appointed as Lecturers and given reduced teaching load. They may simultaneously be allowed to register in Ph.D. programme, subject to their qualifying the conditions of registration. These Lecturers may be paid a consolidated salary of ₹30,000/-, ₹35,000/- and ₹40,000/- respectively during the first, second and third year of their service in the University.

2. Those completing their Ph.D. degree within 3 year duration may be designated as Assistant Professors and placed in regular scale with three additional increments for obtaining Ph.D. degree while in service of the University.

Anis Ahmed

3. Those unable to finish their Ph.D. in three years time may be considered on case to case basis for extension of one year. Their services may be dispensed with if they are not awarded Ph.D. degree within the extended period of one year.

4. For appointment as Lecturers in Sciences, Mathematics, Social Sciences and Humanities streams, the Ph.D. should be a desirable qualification for fresh candidates who have no teaching experience.

The Council noted that the qualifications and experience etc as prescribed by UGC and other Statutory Councils for various study programmes of the Schools may be taken as minimum for faculty recruitment particularly in view of the pursuit of Sharda University in attaining the status of Global Centre of learning.

The meeting ended with a vote of thanks to the Chair.

Avais Ahmad

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Content of Annexure of Minutes of 6th Academic Council

6.13	**XIV**	**A** to **E**	To consider a proposal received from School of Business Studies for starting additional **Trimester based MBA programs** together with the Course Structure and Credit distribution, proposed to be offered from the Academic Year 2012-13. **1.** Master of Business Administration - Banking and Finance **2.** Master of Business Administration - Retail Management **3.** Master of Business Administration - Consulting Services **4.** Master of Business Administration - Security and Intelligence Management (**Course Details for Master of Business Administration (MBA) Trimester based, SBS**)	**453** to **507**
6.14	**XV**	**-**	To consider a proposal received from School of Business Studies for starting Executive MBA programme together with the Course Structure and Credit distribution, proposed to be offered from the Academic Year 2012-13;	**508**
6.16	**XVII**	**-**	To consider recommendations of the Committee constituted to examine equivalence of the work done by the **Chinese students** at the Chinese University to the first year BBA programme of Sharda University;	**510**
6.17	**XVIII**	**-**	To consider a proposal received from Dean, School of Allied Health Sciences for starting B.Sc. Medical Imaging Technology (B.Sc. MIT- Radiography), 3 years programme. (**Course Structure and Scheme of Evaluation of B.Sc. MIT-Radiography prog.**)	**512**
6.18	**XIX**	**-**	To approve the Course Structure and Scheme of Evaluation of B.Sc. Medical Laboratory Technology (B.Sc. MLT) programme. (**Course Structure and Scheme of Evaluation of B.Sc. MLT programme**)	**526**
6.19	**XX**	**-**	To consider revision of Course Structure and Scheme of Evaluation for M.Sc. Clinical Research programme and Post Graduate Diploma in Clinical Research. (**Revised Course Structure and Scheme of Evaluation of M.Sc. Clinical Research programme & PG Diploma in Clinical Research**)	**572**
6.20	**XXI**	**-**	To consider the revised recommendations of the committee constituted by the Academic Council on question of Credit Transfer;	**583**
6.21	**XXII**	**A**	To consider **revised Course Structure of the ongoing B.Tech**. programme offered by the School of Engineering & Technology for the students admitted prior to Academic Year 2012-13; (i) **Term VII and Term VIII**, 4th year for all the departments other than B.Tech. (Biotechnology) and	**587**
		B	(ii) Term V onwards for B.Tech. (Automobile Engineering) and	**770**
		C	(iii) Term III onwards for B.Tech. (Biotechnology);	**822**
6.22	**XXIII**	**B**	To approve the revised **Course Structure and Credit Distribution for B.Tech. programmes** offered by School of Engineering & Technology; (i) **Semester I and Semester II, first year**;	**853**
		C	(ii) **Semester III onwards** for the students admitted in Academic Year 2012-13 and onwards.	**886**
6.23	**XXIV**	**B**	To consider **revised** Course Structure and Credit Distribution for **M.Tech., BCA, MCA and M.Sc. Biotechnology** programmes offered by School of Engineering & Technology.	**940**
6.24	**XXV**	**-**	To consider the **Rules, Regulations and Guidelines of examination for BBA and B.Com (Professional)** programmes offered by School of Business Studies;	**1295**
6.25	**XXVI**	**-**	To consider the Course Structure of certificate courses in **French and German** and **B.A (Honours) English** programme proposed to be offered by the **School of Languages** for the students admitted in Academic Year 2012-13 and onwards;	**1299**

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Annexure-I- d & e of Agenda Item no. 6.3

Minutes of the meeting of Admission Committee, April 9, 2012 at 3:00 p.m. in the Board Room, School of Business Studies.

The meeting of Admission Committee was held on April 9, 2012 at 3:00 p.m. in the Board Room, School of Business Studies. The following were present:

1. Prof. J. P. Gupta, Vice Chancellor - In Chair
2. The Registrar
3. Finance Officer
4. Dean, School of Engineering & Technology (officiating)
5. Dean, School of Business Studies
6. Dean, School of Dental Sciences
7. Dean, School of Medical Sciences and Research
8. Dean, School of Architecture & Planning
9. Head, Department of Mass Communication
10. Dr. N. B. Singh – in lieu of Director, RTDC
11. Director, Admissions
12. OSD, School of Engineering & Technology

The following matters were considered by the Committee:

Item No.1 To consider Eligibility Criteria for admission to various programmes run by the University.

The Admission Committee discussed the eligibility criteria for admission to the various programmes of studies for the Academic year 2012-13. The committee made minor changes in the eligibility criteria followed for admission for the year 2011-12 and also decided the eligibility criteria for the courses in which admission will be made for first time in this academic year. The duration of the curses and the eligibility for admission to theses programmes have been detailed in Annexure-I.

Item No.2 To consider the Intake capacity to various programmes of study.

The Committee after detailed discussion resolved to recommend the intake capacity of different programmes for the Academic Year 2012-13 as detailed herein under:

S.No.	Programme(s)	Intake Capacity
1	B.Tech (CS)	480
2	B.Tech (IT)	240
3	B.Tech (E & C)	480
4	B.Tech (E & E)	240
5	B.Tech (E & I)	120
6	B.Tech (ME)	600
7	B.Tech (Civil)	480

8	B.Tech (Biotechnology)	120
9	B.Tech (Automobile)	120
10	*BCA	120
11	*MCA	120
12	M.Tech (Nano Science & Technology)	30
13	M.Tech (Comp. Science & Engineering)	30
14	M.Tech (Energy & Environmental Engg.)	30
15	M.Tech (Power System Engg.)	30
16	M.Tech (Microwave Technology)	30
17	M.Tech (Computer Networking)	30
18	M.Tech (VLSI Technology)	30
19	M.Tech (Biotech)	30
20	M.Tech (Bioinformatics)	30
21	M.Tech (Polymer Technology)	30
22	M.Tech(MEMS)	30
23	M.Tech (Production & Industrial Engg.)	30
24	M.Tech(Material Technology)	30
25	M.Sc. (Biotechnology)	30
26	Ph.D -Bio Technology	10
27	Ph.D -Chemistry	10
28	Ph.D -Civil Engg	10
29	Ph.D -Computer Engg	10
30	Ph.D -Electrical Engg.	10
31	Ph.D -Electronics & Communication Engg.	10
32	Ph.D -Energy Science	10
33	Ph.D -Environment Engg	10
34	Ph.D -Fuel & Energy Technology	10
35	Ph.D-Materials Technology	10
36	Ph.D-Mathematics	10
37	Ph.D-Mechanical Engg	10
38	Ph.D-Nano Technology	10
39	Ph.D-Physics	10
40	*BBA(With Tour)	120
41	*BBA(Without Tour)	240
42	*B.Com (Professional)	120
43	*MBA (With Tour)-Dual Specialization	120
44	*MBA (Without Tour)-Dual Specialization	120
45	*MBA-International Business	40
46	*MBA-Technology Management	40
47	*MBA-Infrastructure Management	40
48	*MBA-Health care & Hospital Administration	40
49	*MBA-Retail Management	40
50	*MBA-Security & Intellegence Management	40
52	*MBA-Banking & Finance	40
53	*MBA-Consulting Services	40
54	Ph.D-Mass Communication	30

55	Ph.D in Management Science(Economics)	10
56	Ph.D in Management Science(Finance)	10
57	Ph.D in Management Science(HR)	10
58	Ph.D in Management Science(Marketing)	10
59	B.D.S. (Trough UPCAT-Dental)	100
60	M.D.S-Oral Pathology & Microbiology	3
61	M.D.S-Prosthodontics and Crown & Bridge	3
62	M.D.S-Conservative Dentistry and Endodontics	3
63	M.D.S-Oral & Maxillofacial Surgery	3
64	M.D.S-Peridontolgy	3
65	M.D.S-Orthodontics & Dentofacial Orthopedics	3
66	M.D.S-Pedodontics and Preventive Dentistry	3
67	MBBS (through UPCMET)	150
68	*B.J.M.C(With International Educational Visit)	60
69	*B.J.M.C(With out Educational Visit)	60
70	M.J.M.C	30
71	P.G. Dip.Adv.& Public Relations	30
72	P.G. Dip.in Development Communication	30
73	General Nursing & Midwifery(GNM)	60
74	B.Sc.(Nursing)-Proposed	100
75	*M.Sc.(clinical Research)-For Life Science Graduate	40
76	*MSc(ClinicalResearch)- For Doctors/Pharmacy	20
77	*PG Dip. In Clinical Research- For Life Science Graduate	30
78	*PG Dip. In Clinical Research- Doctors/Pharmacy	30
79	Dip. In Medical Lab Technology(DMLT)	50
80	Dip. In Operation Theater Technolgy(DOTT)	40
81	Bachelor In Physiotherapy(BPT)	60
82	Dip. In Dietetics & Public Health Nutrition (DDPHN)	30
83	B.Sc.(MLT)	40
84	M.Sc.(Medical Physiology)	5
85	M.Sc.(Medical Microbiology)	5
86	M.Sc.(Medical Anatomy)	5
87	M.Sc.(Medical Bio Chemistry)	5
88	M.Sc.(Medical Pharmacology)	5
89	BBA LLB (Integrated)	120
90	BA LLB (Integrated)	120
91	B.Com LLB (Integrated)	120
92	BS-M.S (Integrated)- Physics	60
93	BS-M.S (Integrated)- Chemistry	60
94	BS-M.S (Integrated)- Mathematics	60
95	BS-M.S (Integrated)-Biological Sciences	60
96	B.A.(Hons.)- English	60
97	B.A.(Hons.)- German	60
98	B.A.(Hons.)- French	60
99	B.A.(Hons.)- Spanish	60

100	Certificate course in foreign Languages(English)-Part Time	30
101	Certificate course in foreign Language(French)-Part Time	30
102	Certificate course in foreign Languages(Spanish.)-Part Time	30
103	Certificate course in foreign Languages(German.)-Part Time	30
104	Certificate course in foreign Languages(Chinese)-Part Time	30
105	**Bachelor Of Design(B.Des.)	60
106	**Master Of Design(M.Des.)	30
107	**B.Arch.	80
108	Master in Arts (Habitat Studies)	30

Item No.3 To consider date of commencement and date of conclusion of the admission process.

The Committee authorized the Vice Chancellor to decide the date of commencement and date of conclusion of admissions keeping in view the dates of commencement of registration as per the Academic Calendar for the year 2012-13.

The meeting ended with a vote of thanks to the Chair.

S.No	Programme	Duration in Years	Eligibility
	School of Engineering & Technology		
1	B.Tech (CS)	4	Matriculation with- 60%Marks, Sr.Secondary (10+2) 60%Marks(Aggregate & PCM) + SURE (Online Test), followed by Personal Interview **or** AIEEE All India Rank; Less than 2,00,000 with (10+2) Sr. Secondary Agg. 60% Marks **or** UPSEE Rank Less than 60,000 with (10+2) Sr. Secondary Agg. 60% Marks
2	B.Tech (IT)	4	
3	B.Tech (E & C)	4	
4	B.Tech (E & E)	4	
5	B.Tech (E & I)	4	
6	B.Tech (ME)	4	
7	B.Tech (Civil)	4	
8	B.Tech (Biotechnology)	4	
9	B.Tech (Automobile)	4	
10	*BCA	3	• Sr. Secondary (10+2) with 50% marks. • Mathematics/Statistics/ Computer/Information Science being one of the Subjects
11	*MCA	3	• BCA/B.Sc. with a minimum 50% Marks • Must have studied Mathematics at Graduation or Se. Secondary level
12	M.Tech (Nano Science & Technology)	2	• B. Tech in any branch of Engineering & Technology with 60% marks. • M. Sc. in Physics, Chemistry, Materials Science, Electronics, Biotechnology with 55% marks. • GATE / NET qualified students shall be preferred.
13	M.Tech (Comp. Science & Engineering)	2	• B. Tech in Computer Science, IT, Electronics & Communication with 60% marks. • MCA/ M.Sc (Computer Sc) with 55% marks. • GATE / NET qualified students shall be preferred.

14	M.Tech (Energy & Environmental Engg.)	2	• B. Tech in any branch of Engineering & Technology with 60% marks. • M. Sc. in Physics, Chemistry, Biology, Zoology, Mathematics, Environmental Science, Geology, Electronics with 55% marks. • GATE / NET qualified students shall be preferred.
15	M.Tech (Power System Engg.)	2	• B. Tech in Electronics, Electrical Engineering with 60% marks. • M.Sc. (Physics with electronics) with 55% marks • GATE / NET qualified students shall be preferred.
16	M.Tech (Microwave Technology)	2	• B. Tech/BE in Electronics, Electronics & C, E& E, E& I, E& TC with 60% marks. • M.Sc (Physics/Electronics) with 55% marks • GATE / NET qualified students shall be preferred.
17	M.Tech (Computer Networking)	2	• B. Tech in Computer Science, IT, Electronics & Communication with 60% marks. • MCA/ M.Sc (Computer Sc) with 55% marks. • GATE / NET qualified students shall be preferred.
18	M.Tech (VLSI Technology)	2	• B. Tech/BE in Electronics, E&C, E& E, E& I, E&TC with 60% marks. • M. Sc. in Physics, Electronics with 55% marks. • GATE / NET qualified students shall be preferred.
19	M.Tech (Bioinformatics)	2	• B. Tech in Biotechnology, Biomedical Engineering, Agricultural Engineering or any relevant branch with 60% marks. • M. Sc. in Chemistry, Physics, Biology, Biotechnology, Medicinal Chemistry,

			Microbiology, Biochemistry, Genetics, Molecular Biology and Agriculture with 55% marks. • GATE / NET qualified students shall be preferred.
20	M.Tech (Biotech)	2	• B. Tech in Biotechnology, Biomedical Engineering, with 60% marks. • M. Sc. In, Biotechnology, Agriculture, Genetics, Molecular Biology, Physiology, any branches of life sciences (Botany, Zoology, Biochemistry, Microbiology, Medicinal Chemistry) with 55% marks. • GATE / NET qualified students shall be preferred.
21	M.Tech (Polymer Technology)	2	• B. Tech in Chemical, Mechanical, civil, electronics, ceramics with 60% marks. • M. Sc. in Chemistry, Materials Science, Physics with 55% marks. • GATE / NET qualified students shall be preferred.
22	M.Tech (MEMS Technology)	2	• B. Tech/BE in Electronics, Electronics & C, E& E, E& I, E& TC, B.Tech Nano with 60% marks. • M. Sc. in Physics, Electronics with 55% marks. • GATE / NET qualified students shall be preferred.
23	M.Tech (Production & Industrial Engg.)	2	• B. Tech/BE/B.Sc. (Engg) in Mechanical, Automobile, Electronics, Electrical, Metallurgy, Materials Technology and Civil with 60% marks. • GATE / NET qualified students shall be preferred.

24	M.Tech(Material Technology)	2	• B. Tech in Electronics, Ceramics, Mechanical, Electrical, Chemical, Civil Engineering or any relevant branch with 60% marks. • M. Sc. / M.Phil in Physics, Chemistry, Materials Science with 55% marks. • GATE / NET qualified students shall be preferred.
25	M. Tech in Electric Drives and Power Electronics	2	• B. Tech in Electronics, Electrical, Instrumentation Engineering with 60% marks. • M.Sc. (Physics with electronics) with 55% marks • GATE / NET qualified students shall be preferred.
26	M.Sc. (Biotechnology)	2	B.Sc./BVSC/BDS/MBBS with 55% marks
27	Ph.D -Bio Technology	2	• MS/ M.Tech. with 1st class or CGPA of 6.75 or above on a 10-points scale. • Sciences : Post-graduation with 55% marks or a CGPA of 6.25 or above. • Preference will be given to candidates who have qualified NET/ GATE or other equivalent examination. • In exceptional cases a candidate with a B. Tech/ BS degree with minimum 75% marks or CGPA of 8.25 may be directly enrolled in Ph.D in relaxation of the prescribed qualifications, provided he/she is working with an institution/ organization of national repute engaged in research work and has over 5 years of research experience and has published at least

			four papers in refereed/ national/ international journals. DRC may consider the eligibility for admission of such candidates based on his/ her published reports/ patents etc. If deemed necessary, DRC may suggest completion of few audit/ credit courses for such candidates.
28	Ph.D -Chemistry	2	
29	Ph.D -Civil Engg	2	
30	Ph.D -Computer Engg	2	
31	Ph.D -Electrical Engg.	2	
32	Ph.D -Electronics & Communication Engg.	2	

33	Ph.D -Energy Science	2	
34	Ph.D -Environment Engg	2	
35	Ph.D -Fuel & Energy Technology	2	
36	Ph.D-Materials Technology	2	
37	Ph.D-Mathematics	2	
38	Ph.D-Mechanical Engg	2	

39	Ph.D-Nano Technology	2	
40	Ph.D-Physics	2	
	School Of Business Studies		
41	*BBA(With Tour)	3	• Sr. Secondary (10+2) with 50% marks. • Commerce / Mathematics as a subject at Secondary & Sr. Secondary level • Proficiency in English Communication
42	*BBA(Without Tour)	3	
43	*B.Com (Professional)	3	• Sr. Secondary (10+2) with 50% marks. • Commerce / Mathematics as a subject at Secondary & Sr. Secondary level • Proficiency in English Communication
44	*MBA (With Tour)-Dual Specialization	2	• Graduation with 50% marks • Proficiency in English Communication •SURE (Online Test), followed by Group Discussion / Personal Discussion **OR** • Graduation with 50% marks • MAT with 75% percentile score • Group Discussion / Personal Discussion **OR** • Graduation with 50% marks • CAT with 65% percentile score • Group Discussion / Personal Discussion
45	*MBA (Without Tour)-Dual Specialization	2	
46	*MBA-International Business	2	
47	*MBA-Technology Management	2	
48	*MBA-Infrastructure Management	2	
49	*MBA-Retail Management	2	
50	*MBA-Security & Intellegence Management	2	
51	*MBA-Banking & Finance	2	
52	*MBA-Consulting Services	2	
53	*MBA-Health care & Hospital Administration	2	• MBBS/ BDS/ B.Sc. / B.Sc. (Biology) / BAMS / BHMS / B.Pharma / BPT / M.Pharma / MPT / Equivalent degree
54	Ph.D in Management Science(Economics)	2	• MBA with 1st divison or CGPA of

55	Ph.D in Management Science(Finance)	2	6.75 or above on a 10-points scale. • Humanities/Commerce: Post graduation with 55% marks or a CGPA of 6.25 or above on a 10-points scale • Preference will be given to candidates who have qualified NET/ GATE or other equivalent examination.
56	Ph.D in Management Science(HR)	2	
57	Ph.D in Management Science(Marketing)	2	
	School Of Dental Sciences		
58	B.D.S. (through UPCAT-Dental)	4+1	• Sr. Secondary (10+2) with 50% marks in PCB & English • Should have passed qualifying examination • Minimum age 17 years
59	M.D.S-Oral Pathology & Microbiology	3	BDS with min.50% marks,
60	M.D.S-Prosthodontics and Crown & Bridge	3	
61	M.D.S-Conservative Dentistry and Endodontics	3	
62	M.D.S-Oral & Maxillofacial Surgery	3	
63	M.D.S-Peridontolgy	3	
64	M.D.S-Orthodontics & Dentofacial Orthopedics	3	
65	M.D.S-Pedodontics and Preventive Dentistry	3	
	School of Medical Sciences & Research		
66	MBBS (through UPCMET)	4.5+1	• Sr. Secondary (10+2) with Physics, Chemistry & Biology, 50% marks in aggregate. • English as one of the main study languages with 50% marks • Minimum age 17 years
	School Allied Sciences & Creative Arts(SASCA)		
67	*B.J.M.C(With Educational International Visit)	3	• Sr. Secondary (10+2) with 50% marks • Proficiency in English Communication
68	*B.J.M.C(With out International Educational Visit)	3	
69	M.J.M.C	2	• Graduation • Proficiency in English Communication • Creative Personality
70	P.G. Dip.Adv.& Public Relations	1	• Graduation • Proficiency in English Communication • Creative Personality
71	P.G. Dip.in Development Communication	1	• Graduation • Proficiency in English Communication • Creative Personality

72	Ph.D-Mass Communication	2	• Post-Graduation with 55% marks or a CGPA of 6.25 or above on a 10-point scale. • NET qualified candidate exempted from Entrance Examination (can make a presentation).
	School Of Allied Health Sciences		
73	General Nursing & Midwifery(GNM)	3.5	• Sr. Secondary (10+2) with minimum 45% marks • Science background at Secondary level • Good knowledge of English • Minimum age 17 years
74	B.Sc.(Nursing)-Proposed	4	• Sr. Secondary (10+2) in PCB • Good knowledge of English • Minimum age 17 years
75	*M.Sc.(clinical Research)-For Life Science Graduate	2	• B.Sc. Life Sciences
76	*MSc(ClinicalResearch)- For Doctors/Pharmacy	2	• BVSC / BDS / MBBS / BHMS / BAMS / B. Pharma/BVSC
77	*PG Dip. In Clinical Research- For Life Science Graduate	1	• B.Sc. Life Sciences
78	*PG Dip. In Clinical Research- Doctors/Pharmacy	1	• BVSC / BDS / MBBS / BHMS / BAMS / B. Pharma/BVSC
79	Dip. In Medical Lab Technology(DMLT)	2	• Sr. Secondary (10+2) in PCB • Good knowledge of English
80	Dip. In Operation Theater	2	• Sr. Secondary (10+2) in PCB/M • Good knowledge of English
81	Bachelor In Physiotherapy(BPT)	4.5	• Sr. Secondary (10+2) with Biology or Life Sciences as one of the subjects with Minimum 45% Marks. • Minimum age 17 years
82	Dip. In Dietetics & Public Health Nutrition (DDPHN)	1	• B.Sc. (Biology) / B.Sc. (Home Science)
83	B.Sc.(MLT)	3	• Sr. Secondary (10+2) in PCB • Good knowledge of English
84	M.Sc.(Medical Physiology)	3*	• MBBS / BDS / BVSC / B.Sc. Life Sciences / B.Sc. in respective field; with 55% marks for General Category and 50% marks for Reserved Categories.
85	M.Sc.(Medical Microbiology)	3*	
86	M.Sc.(Medical Anatomy)	3*	
87	M.Sc.(Medical Bio Chemistry)	3*	
88	M.Sc.(Medical Pharmacology)	3*	
	* The Course duration for the candidate with MBBS & BDS qualification shall be 2 Years		
	School of Law		
89	*BBA LLB (Integrated)	5	• Sr. Secondary (10+2) with 50% marks • Proficiency in English Communication • No exit option available
90	*BA LLB (Integrated)	5	

91	*B.Com LLB (Integrated)	5	• Sr. Secondary (10+2) with 50% marks • Proficiency in English Communication • No exit option available
	School of Basic Sciences		
92	BS-MS (Physics)	5	• Candidates who have completed their II PUC / 12th Standard or equivalent. The candidates must have studied Physics, Chemistry, Mathematics and Biology as main subjects during their PUC / 12th Standard. Candidates who have studied Biology, Statistics, Electronics, Computer Science, etc., should also have taken Physics, Chemistry, and Mathematics. The candidates should have a first class or 60% or an equivalent grade. • Based on the merit lists of one of the following national examinations: KVPY-SA-2009 (selected as fellows), KVPY-SB (appeared in 2010), KVPY-SX/SB+2 (appeared in 2010), IIT-JEE (appearing in 2012), AIEEE (appearing in 2012), and AIPMT (appearing in 2012).
93	BS-MS (Chemistry)	5	
94	BS-MS (Mathematics)	5	
95	BS-MS (Biological Sciences)	5	
	School of Language		
96	B.A.(Hons.)- English & communications	3	• Sr. Secondary (10+2) with 50% marks • Proficiency in English Communication
97	B.A.(Hons.)- German	3	
98	B.A.(Hons.)- French	3	
99	B.A.(Hons.)- Spanish	3	
100	Certificate course in foreign Languages(English)-Part Time	3 Months	*Should be studying in B.Tech/BBA/BCA/BJMC/B.Com in a recognized University/ College/ Institute.
101	Certificate course in foreign Language(French)-Part Time	3 Months	
102	Certificate course in foreign Languages(Spanish.)-Part Time	3 Months	
103	Certificate course in foreign Languages(German.)-Part Time	3 Months	
104	Certificate course in foreign Languages(Chinese)-Part Time	3 Months	
	School of Design		
105	**Bachelor Of Design (B.Des.)	4	• Sr. Secondary (10+2) with 50% marks • Proficiency in English Communication NATA Qualified preffered
106	**Master Of Design (M.Des.)	2	
	School Of Architecture & Planning		
107	**B.Arch.	5	• Sr. Secondary with Mathematics (10+2)Minimum 50% marks,

108	B.Arch(With out Laptop)	5	*Should be NATA qualified • Proficient in English Communication
109	Master of Arts (Habitat Studies)	2	Graduation in any discipline with 50% Marks.
	• **Fellowships available for selected M.Tech./Ph.D students.**		

***Laptop will be Provided**
****** Graphic Laptop(Dell/Apple) will be provided**
 # Tuition fee of Ph.D for foreign students is $3000, Refundable Security, Examination fee and Registration fee also applicable

Additional Fee:-	
Examination Fee	**Rs. 5000/- (per Annum)**
Registration Fee	**Rs. 2000/- (per Annum)**
Security Deposit(Refundable)	**INR**
BDS	50,000
MDS	100,000
MBBS	150,000
GNM	5,000
Rest Courses	10,000
***Minimum Admissions required for running a programme: Bachelor degree programme - 20 admissions; Post Graduate Programmes - 10 admissions.**	

Annexure-II- g, h & i of Agenda Item no. 6.3

Minutes of the meeting of Fee Committee held on April 9, 2012 at 4:00 pm in the Board Room, School of Business Studies of the University.

A meeting of the Fee Committee was held on April 9, 2012 at 4:00 pm in the Board Room, School of Business Studies of the University. The followings were present:

1. Prof. J. P. Gupta, Vice Chancellor - In Chair
2. Registrar
3. Finance Officer
4. Dean, School of Engineering & Technology (officiating)
5. Dean, School of Business Studies
6. Dean, School of Dental Sciences
7. Dean, School of Medical Sciences and Research
8. Dean, School of Architecture & Planning
9. Director, Admissions

The Finance Officer briefed the Committee of the fee charged from the students admitted in the Academic year 2011-12. He also apprised the members of the cost incurred by the University (programme-wise) during the on-going Academic Year 2011-12.

Item No.1: To consider the fee to be charged from the students to be admitted in the Academic Year 2012-13.

The Committee after discussing in detail recommended the fee to be charged from the students to be admitted in the Academic Year 2012-13 as detailed in Annexure.

Item No.2: To consider the fee charged for various categories of Hostel accommodation (food included) for the year 2012-13.

The committee after detailed discussion resolved to recommend the following fee to be charged from the students for different categories of Hostel accommodation (food included) for the Academic Year 2012-13:

Girls:

i. **Sarojini and Kasturba Hostel , Non-Air-conditioned Rooms:**

3 seater rooms	`75,000/- per person, per annum
2 seater rooms with attached toilet	`90,000/- per person, per annum
Single seater rooms	`90,000/- per person, per annum

Avais Ahmad.

ii. **Tower in between Sarojini and Kasturba Hostel, Air-conditioned Rooms:**

2 seater rooms	`1,20,000/- per person, per annum

iii. **NRI Hostel, Air-conditioned Rooms (for Medical and Dental Students):**

2 seater rooms with attached toilet	`1,40,000/- per person, per annum

Boys:

i. **V. S. Hostel, Non-Air-conditioned Rooms:**

2 seater rooms	`80,000/- per person, per annum

ii. **Tagore & Vivekananda Hostel**

a. **Non-Air-conditioned Rooms:**

3 seater rooms	`75,000/- per person, per annum

b. **Tagore Hostel, Air-conditioned Rooms:**

2 seater rooms	`1,20,000/- per person, per annum

iii. **Tower in between Tagore & Vivekananda Hostel, Air-conditioned Rooms:**

2 seater rooms with attached toilet	`1,40,000/- per person, per annum

Accommodation for Foreign Students:

2 seater rooms with attached toilet:	
With Vegetarian Food	US $ 2,800/- per person, per annum
With Non-Vegetarian Food	US $ 3,300/- per person, per annum

The Committee also decided that:-

1. The last date for payment of Hostel Fee will be June 05, 2012.
2. Those seeking Hostel accommodation for the first time will be required to pay the Hostel Security of `5,000/-(Rupees Five Thousand only) alongwith the Hostel Fee.
3. Subject to availability of seats, the Hostel room may be allotted to the students paying requisite Hostel fee after June 5, 2012. However, a penalty @2% per month shall be charged for late submission of Hostel Fee.
4. The last date for payment of Hostel Fee for Medical and Dental students will be September05, 2012. However, these students will be required to Register for Hostel accommodation by June 05, 2012 by making an application to this effect and depositing an advance of `20,000/- (non-refundable).
5. The students allotted non-air-conditioned rooms will be allowed to install Room-coolers subject to the following:
   a. Payment of Electricity Charges @ `2,000/- (rupees two thousand) per student.
   b. Purchase of a Room-Cooler as per specifications available with IHA department.

Anis Ahmad.

Item No.3: To consider the Scholarship Policy for admission in the Academic Year 2012-13.

The committee after detailed discussion resolved to recommend the Scholarship Policy for admission in the Academic Year 2012-13 as detailed herein under:

Scholarship Policy (2012-13)

For B.Tech Admissions

12th PCM %	AIEEE Rank (AIR)	UPSEE Rank (Gen.)	Scholarship
Above 95%	0-10,000	0-1,000	100%
90-94.99%	10,000-25,000	1,001-5,000	50%
85-89.99%	25,001-75,000	5,001-7,500	25%

For MBA Admissions

MAT %ile	CAT %ile	Scholarship
Above 99%	Above 95%	100%
95-98.99%	90-94.99%	50%
85-94.99%	80-89.99%	25%

Scholarship Policy for SGI Students for MBA

Graduate	Scholarship.
BBA/ B.Com/B.Tech	25% Per Year

For BBA/B.Com/BJMC Admission

90% over all and above in (10+2)	100%
85-89.99%	50%
76-84.99%	25%

Anais Ahmad

Note:-

- **75% Marks in English in 12th Board exam is Compulsory for grant of Scholarship in UG Programs.**
- **Scholarship will be continued provided the student exhibits good academic record and maintains a CGPA above 8.0 in all examinations.**
- **Performance in qualifying examination held only in 2012 session will be considered.**
- **Maximum no. of Scholarship in each category is 200.**

The meeting ended with a vote of thanks to the chair.

Arais Ahmad

SHARDA UNIVERSITY

32, 34, Knowledge Park-III, Greater Noida-201306 (U.P.)

Fee to be charged from students to be admitted in Academic Year 2012-13.

S. No	Programme(s)	Duration in Years	Annual Fee	Security Deposit (refundable)	Examination Fee (per annum)	Registration Fee (per annum)	Total	Fee Payment Schedule
	School of Engineering & Technology							
1	B.Tech (CS)	4	130,000	10,000	5,000	2,000	147,000	Annually
2	B.Tech (IT)	4	130,000	10,000	5,000	2,000	147,000	Annually
3	B.Tech (E & C)	4	130,000	10,000	5,000	2,000	147,000	Annually
4	B.Tech (E & E)	4	130,000	10,000	5,000	2,000	147,000	Annually
5	B.Tech (E & I)	4	130,000	10,000	5,000	2,000	147,000	Annually
6	B.Tech (ME)	4	130,000	10,000	5,000	2,000	147,000	Annually
7	B.Tech (Civil)	4	130,000	10,000	5,000	2,000	147,000	Annually
8	B.Tech (Biotechnology)	4	130,000	10,000	5,000	2,000	147,000	Annually
9	B.Tech (Automobile)	4	130,000	10,000	5,000	2,000	147,000	Annually
10	*BCA	3	120,000	10,000	5,000	2,000	137,000	Annually
11	*MCA	3	120,000	10,000	5,000	2,000	137,000	Semester-wise
12	M.Tech (Nano Science & Technology)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
13	M.Tech (Comp. Science & Engineering)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
14	M.Tech (Energy & Environmental Engg.)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
15	M.Tech (Power System Engg.)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
16	M.Tech (Microwave Technology)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
17	M.Tech (Computer Networking)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
18	M.Tech (VLSI Technology)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
19	M.Tech (Bioinformatics)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
20	M.Tech (Biotech)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
21	M.Tech (Polymer Technology)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
22	M.Tech (MEMS Technology)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
23	M.Tech (Production & Industrial Engg.)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
24	M.Tech(Material Technology)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
25	*M. Tech in Electric Drives and Power Electronics*	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
26	M.Sc. (Biotechnology)	2	120,000	10,000	5,000	2,000	137,000	Semester-wise
27	Ph.D -Bio Technology	2	60,000	10,000	5,000	2,000	77,000	Annually
28	Ph.D -Chemistry	2	60,000	10,000	5,000	2,000	77,000	Annually
29	Ph.D -Civil Engg	2	60,000	10,000	5,000	2,000	77,000	Annually
30	Ph.D -Computer Engg	2	60,000	10,000	5,000	2,000	77,000	Annually

Avais Ahmad

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Fee to be charged from students to be admitted in Academic Year 2012-13.

S. No	Programme(s)	Duration in Years	Annual Fee	Security Deposit (refundable)	Examination Fee (per annum)	Registration Fee (per annum)	Total	Fee Payment Schedule
31	Ph.D -Electrical Engg.	2	60,000	10,000	5,000	2,000	77,000	Annually
32	Ph.D -Electronics & Communication Engg.	2	60,000	10,000	5,000	2,000	77,000	Annually
33	Ph.D -Energy Science	2	60,000	10,000	5,000	2,000	77,000	Annually
34	Ph.D -Environment Engg	2	60,000	10,000	5,000	2,000	77,000	Annually
35	Ph.D -Fuel & Energy Technology	2	60,000	10,000	5,000	2,000	77,000	Annually
36	Ph.D-Materials Technology	2	60,000	10,000	5,000	2,000	77,000	Annually
37	Ph.D-Mathematics	2	60,000	10,000	5,000	2,000	77,000	Annually
38	Ph.D-Mechanical Engg	2	60,000	10,000	5,000	2,000	77,000	Annually
39	Ph.D-Nano Technology	2	60,000	10,000	5,000	2,000	77,000	Annually
40	Ph.D-Physics	2	60,000	10,000	5,000	2,000	77,000	Annually
	School of Business Studies							
41	*BBA(With Tour)	3	150,000	10,000	5,000	2,000	167,000	Semester-wise
42	*BBA(Without Tour)	3	120,000	10,000	5,000	2,000	137,000	Semester-wise
43	*B.Com (Professional)	3	110,000	10,000	5,000	2,000	127,000	Semester-wise
44	*MBA (With Tour)-Dual Specialization	2	335,000	10,000	5,000	2,000	352,000	Semester-wise
45	*MBA (Without Tour)-Dual Specialization	2	275,000	10,000	5,000	2,000	292,000	Semester-wise
46	*MBA-International Business	2	200,000	10,000	5,000	2,000	217,000	Semester-wise
47	*MBA-Technology Management	2	200,000	10,000	5,000	2,000	217,000	Semester-wise
48	*MBA-Infrastructure Management	2	200,000	10,000	5,000	2,000	217,000	Semester-wise
49	*MBA-Retail Management	2	200,000	10,000	5,000	2,000	217,000	Semester-wise
50	*MBA-Security & Intellegence Management	2	200,000	10,000	5,000	2,000	217,000	Semester-wise
51	*MBA-Banking & Finance	2	200,000	10,000	5,000	2,000	217,000	Semester-wise
52	*MBA-Consulting Services	2	200,000	10,000	5,000	2,000	217,000	Semester-wise
53	*MBA-Health care & Hospital Administration	2	200,000	10,000	5,000	2,000	217,000	Semester-wise
54	Ph.D in Management Science(Economics)	2	60,000	10,000	5,000	2,000	77,000	Annually
55	Ph.D in Management Science(Finance)	2	60,000	10,000	5,000	2,000	77,000	Annually
56	Ph.D in Management Science(HR)	2	60,000	10,000	5,000	2,000	77,000	Annually
57	Ph.D in Management Science(Marketing)	2	60,000	10,000	5,000	2,000	77,000	Annually
	School Of Dental Sciences							
58	B.D.S. (through UPCAT-Dental)	4+1	250,000	50,000	5,000	2,000	307,000	Annually

Ayaz Ahmad

SHARDA UNIVERSITY

32, 34, Knowledge Park-III, Greater Noida-201306 (U.P.)

Fee to be charged from students to be admitted in Academic Year 2012-13.

S. No	Programme(s)	Duration in Years	Annual Fee	Security Deposit (refundable)	Examination Fee (per annum)	Registration Fee (per annum)	Total	Fee Payment Schedule
59	M.D.S-Oral Pathology & Microbiology	3	650,000	100,000	5,000	2,000	757,000	Annually
60	M.D.S-Prosthodontics and Crown & Bridge	3	650,000	100,000	5,000	2,000	757,000	Annually
61	M.D.S-Conservative Dentistry and Endodontics	3	650,000	100,000	5,000	2,000	757,000	Annually
62	M.D.S-Oral & Maxillofacial Surgery	3	650,000	100,000	5,000	2,000	757,000	Annually
63	M.D.S-Peridontolgy	3	650,000	100,000	5,000	2,000	757,000	Annually
64	M.D.S-Orthodontics & Dentofacial Orthopedics	3	650,000	100,000	5,000	2,000	757,000	Annually
65	M.D.S-Pedodontics and Preventive Dentistry	3	650,000	100,000	5,000	2,000	757,000	Annually
	School of Medical Sciences & Research							
66	MBBS (through UPCMET)	4.5+1	669,000	150,000	5,000	2,000	826,000	1st Year, Ist Professional, 12 Months 2nd Year, 2nd Professional, 18 months 3rd Year, 3rd Professional, 24 Months (1/2) 4th Year, 3rd Professional, 24 Months (1/2).
	School Of Allied Health Sciences							
67	General Nursing & Midwifery(GNM)	3.5	50,000	5,000	5,000	2,000	62,000	Annually
68	B.Sc.(Nursing)-Proposed	4	90,000	10,000	5,000	2,000	107,000	Annually
69	*M.Sc.(clinical Research)-For Life Science Graduate	2	1,90,000	10,000	5,000	2,000	207,000	Semester-wise
70	*MSc(ClinicalResearch)- For Doctors/Pharmacy	2	1,60,000	10,000	5,000	2,000	177,000	Semester-wise
71	*PG Dip. In Clinical Research- For Life Science Graduate	1	2,20,000	10,000	5,000	2,000	237,000	Semester-wise

Avais Ahmad

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Fee to be charged from students to be admitted in Academic Year 2012-13.

S. No	Programme(s)	Duration in Years	Annual Fee	Security Deposit (refundable)	Examination Fee (per annum)	Registration Fee (per annum)	Total	Fee Payment Schedule
72	*PG Dip. In Clinical Research- Doctors/Pharmacy	1	1,70,000	10,000	5,000	2,000	187,000	Semester-wise
73	Dip. In Medical Lab Technology(DMLT)	2	40,000	10,000	5,000	2,000	57,000	Annually
74	Dip. In Operation Theater	2	40,000	10,000	5,000	2,000	57,000	Annually
75	Bachelor In Physiotherapy(BPT)	4.5	80,000	10,000	5,000	2,000	97,000	Annually
76	Dip. In Dietetics & Public Health Nutrition (DDPHN)	1	60,000	10,000	5,000	2,000	77,000	Annually
77	B.Sc.(MLT)	3	65,000	10,000	5,000	2,000	82,000	Annually
78	M.Sc.(Medical Physiology)	3*	120,000	10,000	5,000	2,000	137,000	Annually
79	M.Sc.(Medical Microbiology)	3*	120,000	10,000	5,000	2,000	137,000	Annually
80	M.Sc.(Medical Anatomy)	3*	120,000	10,000	5,000	2,000	137,000	Annually
81	M.Sc.(Medical Bio Chemistry)	3*	120,000	10,000	5,000	2,000	137,000	Annually
82	M.Sc.(Medical Pharmacology)	3*	120,000	10,000	5,000	2,000	137,000	Annually
	* The Course duration for the candidate with MBBS & BDS qualification shall be 2 Years							
	School of Law							
83	*BBA LLB (Integrated)	5	120,000	10,000	5,000	2,000	137,000	Annually
84	*BA LLB (Integrated)	5	120,000	10,000	5,000	2,000	137,000	Annually
85	*B.Com LLB (Integrated)	5	120,000	10,000	5,000	2,000	137,000	Annually
	School of Basic Sciences							
86	BS-MS (Physics)	5	70,000	10,000	5,000	2,000	87,000	Annually
87	BS-MS (Chemistry)	5	70,000	10,000	5,000	2,000	87,000	Annually
88	BS-MS (Mathematics)	5	70,000	10,000	5,000	2,000	87,000	Annually
89	BS-MS (Biological Sciences)	5	70,000	10,000	5,000	2,000	87,000	Annually
	School of Language							
90	B.A.(Hons.)- English & communications	3	90,000	10,000	5,000	2,000	107,000	Annually
91	B.A.(Hons.)- German	3	90,000	10,000	5,000	2,000	107,000	Annually
92	B.A.(Hons.)- French	3	90,000	10,000	5,000	2,000	107,000	Annually
93	B.A.(Hons.)- Spanish	3	90,000	10,000	5,000	2,000	107,000	Annually
94	Certificate course in foreign Languages(English)- Part Time	3 Months	30,000	10,000	5,000	2,000	47,000	one time

Avais Ahmad

SHARDA UNIVERSITY

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Fee to be charged from students to be admitted in Academic Year 2012-13.

S. No	Programme(s)	Duration in Years	Annual Fee	Security Deposit (refundable)	Examination Fee (per annum)	Registration Fee (per annum)	Total	Fee Payment Schedule
95	Certificate course in foreign Language(French)-Part Time	3 Months	30,000	10,000	5,000	2,000	47,000	one time
96	Certificate course in foreign Languages(Spanish.)-Part Time	3 Months	30,000	10,000	5,000	2,000	47,000	one time
97	Certificate course in foreign Languages(German.)-Part Time	3 Months	30,000	10,000	5,000	2,000	47,000	one time
98	Certificate course in foreign Languages(Chinease)-Part Time	3 Months	30,000	10,000	5,000	2,000	47,000	one time
	School of Design							
99	*B.J.M.C(With Educational International Visit)	3	150,000	10,000	5,000	2,000	167,000	Annually
100	*B.J.M.C(With out International Educational Visit)	3	120,000	10,000	5,000	2,000	137,000	Annually
101	M.J.M.C	2	120,000	10,000	5,000	2,000	137,000	Annually
102	P.G. Dip.Adv.& Public Relations	1	90,000	10,000	5,000	2,000	107,000	Annually
103	P.G. Dip.in Development Communication	1	90,000	10,000	5,000	2,000	107,000	Annually
104	Ph.D-Mass Communication	2	60,000	10,000	5,000	2,000	77,000	Annually
105	**Bachelor Of Design (B.Des.)	4	150,000	10,000	5,000	2,000	167,000	Annually
106	**Master Of Design (M.Des.)	2	170,000	10,000	5,000	2,000	187,000	Annually
	School Of Architecture & Planning							
107	**B.Arch.	5	150,000	10,000	5,000	2,000	167,000	Annually
108	B.Arch(With out Laptop)	5	130,000	10,000	5,000	2,000	147,000	Annually
109	Master of Arts (Habitat Studies)	2	120,000	10,000	5,000	2,000	137,000	Annually

Fellowships available for M.Tech. /Ph.D. students.

Securiy deposite, Examination fee and Registration fee will be payable annually at the beginning of the Academic Year.

***Laptop will be Provided.**

**** Graphic Laptop(Dell/Apple) will be provided.**

 # Tuition fee of Ph.D for foreign students is $3000, Refundable Security, Examination fee and Registration fee also applicable.

***Minimum Admissions required for running a programme: Bachelor degree programme - 20 admissions; Post Graduate Programmes - 10 admissions.**

Avais Ahmad

SHARDA UNIVERSITY

OFFICE OF THE REGISTRAR

SU/Reg./Note/2012/**066**
June 11, 2012

The Fee Committee in its meeting held on April 9, 2012 has decided the following fee structure for the GNM and B.Sc. Nursing programmes for the Academic Year 2012-13:

Programme(s)	Annual Fee	Security Deposit (refundable)	Examination Fee (per annum)	Registration Fee (per annum)	Total
General Nursing & Midwifery(GNM)	50,000	5,000	5,000	2,000	62,000
B.Sc.(Nursing)-Proposed	90,000	10,000	5,000	2,000	107,,000

The matter was further discussed with Pro-Chancellor at the instance of Principal, School of Nursing. As communicated by Director, Admissions (copy of email enclosed), the fee for Nursing programmes is proposed to be reduced as under:

Programme(s)	Annual Fee	Security Deposit (refundable)	Examination Fee (per annum)	Registration Fee (per annum)	Total
General Nursing & Midwifery(GNM)	45,000	5,000	5,000	2,000	57,000
B.Sc.(Nursing)-Proposed	80,000	5,000	5,000	2,000	92,000

Submitted for consideration before implementation of the reduced fee structure in Nursing programmes for the current Academic Year.

Avais Ahmed 11/6/12
(Avais Ahmad)

Vice-Chancellor: 11.06.12

Chancellor:

Annexure-III-p of Agenda Item no. 6.3

SHARDA UNIVERSITY

32, 34, Knowledge Park-III, Greater Noida (UP)

OFFICE OF THE REGISTRAR

SU/Reg./Notification/2012/**070** May 2, 2012

Notification

In order to help the students who did not fulfill the mandatory requirements of attendance for appearing in the End Term Examination and in order to enable them to catch up with their counter parts, the Vice Chancellor has agreed to give the following relaxations to these students as a very special dispensation:

1. The students debarred from appearing in End Term Examination (ETE) will be allowed to appear in practical examinations, submit dissertation reports and appear in viva-voce examinations.
2. They will be allowed to opt all the courses of even term offered in Summer Term in relaxation of the condition of maximum credits.
3. The students of B.Tech. 3rd year, M.Tech. & MBA 1st year and BBA 2nd year will be given a chance to appear in a specially designed Supplementary Examination to be held along with the Summer Term as they are required to undertake Summer Internship as a part of their Academic curriculum and thus unable to undertake the Summer Term.
4. The condition of awarding a maximum of 'B' Grade on their performance in Summer Term will be relaxed and actual grades will be awarded.

The relaxation as above will be applicable only to those students who submit a written undertaking duly countersigned by their parents stating that:

a. They will attend all the classes during Summer Term and shall not abstain from any class without written permission from their HOD.
b. In future, they shall not abstain from their classes without due permission of their Mentors/HODs.

The students may note that this a one-time dispensation and any violation of the undertaking will make them unfit to the relaxations notified herein above.

Avais Ahmad

(Avais Ahmad)
Registrar

Copy to:

1. The Chancellor / Pro- Chancellor / Vice-Chancellor - for information
2. Chief Advisor to the Chancellor / All Advisors - for information
3. Deans / Principals of all Schools
4. All Directors
5. Dean Students' Welfare
6. Medial Superintendent, Sharda Hospital
7. Principal Secretary to Chancellor
8. Finance Officer / Controller of Examinations /Chief Proctor
9. Chief Security Officer / Ex-Engineer
10. All OSDs / Dy. Registrars / Asstt. Registrars of the Schools – to bring the contents of this Notification to the notice of all Faculty members and Students of their respective Schools.
11. Notification File

Annexure-IV-q of Agenda Item no. 6.3

SHARDA UNIVERSITY

32, 34, Knowledge Park-III, Greater Noida (UP)

OFFICE OF THE REGISTRAR

SU/Reg./Circular /2012/**004** June 6, 2012

Circular

Subject: Registration for Summer Term-2011-12.

In continuation of the Notification no. SU/Reg./Notification/2012/070 dated May 2, 2012 the following clarification is issued to help in registration in Summer Term-2011-12:

- The students debarred from appearing in End Term Examination will be allowed to register for all courses of Even Term offered in Summer Term in relaxation to condition of maximum credit limit.
- The students who may have appeared in End Term Examination and awarded 'F' Grade, will be allowed to register for Summer Term subject to maximum credit limit of 12 credits. The students awarded 'D' Grade and willing to repeat the course(s) will also be allowed to register for Summer Term within the overall ceiling of 12 credits.
- Students awarded 'D' Grade and willing to appear only in 'End Term Examination' will be allowed to register without invoking credit limit of 12 credits.
- The students of B.Tech. 3rd year, M.Tech. & MBA 1st year and BBA 2nd year undertaking Summer Internship and having awarded 'F' Grade will be required to appear in Continuous Evaluation, Mid Term Examination and End Term Examination as scheduled.
- The students obtaining a CGPA of 3.0 or less in both even and odd terms will not be allowed to register in Summer Term as these students will not be able to obtain required CGPA of 5.0 for promotion to the next term, even if they are awarded maximum grade permissible in Summer Term.

Avais Ahmad

(Avais Ahmad)
Registrar

Copy to:

1. The Chancellor / Pro- Chancellor / Vice-Chancellor - for information
2. Chief Advisor to the Chancellor / All Advisors - for information
3. Deans SET, SBS, SAHS, SAD&MS and SAP
4. Dean Students' Welfare
5. Principal Secretary to Chancellor
6. Finance Officer / Controller of Examinations
7. All OSDs / Dy. Registrars / Asstt. Registrars of the Schools – to bring the contents of this Circular to the notice of all Faculty members and Students of their respective Schools.
8. Circular File

Annexure-V-B of Agenda Item no. 6.4

Foundation year:

	2011-12			2012-13			2013-14			2014-15			2015-16	
	LEVEL 1			LEVEL 2			LEVEL 3			LEVEL 4			LEVEL 5	
	Fall	Spring		Fall	Spring		Fall	Spring		Fall	Spring	Total	Fall	Spring
Foundation Studio	studio (12 credits)	studio (12 credits)												
Design Studio/Construction/ Building Sciences/building Material/Estimation/climate/bye laws				1 studio (12 credits)	1 studio (12 credits)		1 studio (12 credits)	1 studio (12 credits)		1 studio (12 credits)	1 studio (12 credits)			
Compulsory Major Seminar				1 course (3 credits)	1 course (3 credits)		I course (3 credits)	I course (3 credits)						
Skills Workshop	2 course (8 credits)	2 course (8 credits)												
Social Science Seminar (Elective)				1 course (3 credits)	1 course (3 credits)		1 course (3 credits)	1 course (3 credits)			1 course (3 credits)			
Research and Communication	1 course (2 credits)	1 course (2 credits)								1 course (3 credits)				
Humanities Seminar (Elective)				1 course (3 credits)	1 course (3 credits)			1 course (3 credits)		1 course (3 credits)				
Advanced Graphic and Computing Skills					1 course (3 credits)									
Building Structures		1 course (3 credits)		1 course (3 credits)	1 course (3 credits)		1 course (3 credits)	1 course (3 credits)		1 course (3 credits)				
Survey and Levelling	1 course (3 credits for 10 weeksonly)													
Management Seminar (Elective)				I course (3 credits)			I course (3 credits)			1 course (3 credits)	1 course (3 credits)			
Arch. Drawing	1 course (3 credits for 5 weeksonly)	1 course (3 credits for 5 weeksonly)												
Total Credits	28	28		27	27		30	30		29	29	236		
Contact Periods	441	465		594	594		540	540		522	522	4218		

Reserved Study Program (5 credits)

Internship (10 credits)

Elective national /International Summer Project (10 credits)

Annual Internship and professional practice credits

FNDS 001-Sound and Image Studio (6 credits)

Class Outline:

This studio is designed to explore concept and creation of works in sound and image using analogue and digital means. The studio will introduce to students mixed media techniques in the virtual and real world. The studio will work towards the creation of original works in audio, video interactivity in many contexts.

Learning Objectives:

1. To explore basic principles relations to the (re) production of sound and image.
2. To understand the basic methods of audio recording and (re)generation.
3. To understand basic methods of image (re)generation and photographic capture.
4. To understand interactivity between sound, image and context.
5. To learn to produce original design and artistic installations (both linear and interactive) using sound, image and context.

Learning Strategy:

Studio based collaborative learning

Contact Period:

90 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

<table>
<tr><td colspan="3">INTERNAL</td><td>EXTERNAL</td></tr>
<tr><td colspan="3">60 % (total marks assigned: 100)</td><td>40% (total marks assigned: 100)</td></tr>
<tr><td>Assessment 1 (Mid-term)</td><td>Continuous Assessment</td><td>Assessment 2 (End-term)</td><td>Assessment 2</td></tr>
<tr><td>Assessment levels: Internal Expert</td><td>Assessment levels: Internal Expert</td><td>Assessment levels: Internal Expert</td><td>Assessment levels: 1) External Expert</td></tr>
<tr><td>Total Marks Assigned: 20 out of 100</td><td>Total Marks Assigned: 50 out of 100</td><td>Total Marks Assigned: 30 out of 100</td><td>Total Marks Assigned: 100</td></tr>
</table>

FNDS 002 -Animation and Storyboarding Studio (6 credits)

Class Outline:

This studio is designed to introduce to students the art of giving life to objects through motion and storytelling. The course emphasizes foundational principles of motion, visual storytelling, and non-linear forms of motion, interactive visualizing, and diverse approaches to motion graphics.

Learning Objectives:

1. To understand the basic principles of Motion.
2. To understand the methods of linear and interactive Visual Storytelling.
3. To understand non-linear, and algorithmic motion.
4. To explore the diverse aesthetic approaches to motion graphics, traditional and digital.
5. The possibilities and relation of motion to time..

Learning Strategy:

Studio based collaborative learning

Contact Period:

90 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks**:**

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 003 - Color, and Texture Studio (6 credits)

Class Outline:

This studio reviews the principles of visual design. Through projects it helps students explore basic principles of color and texture in the visual arts. The course shall emphasize familiarization with colors, textures, and planes.

Learning Objectives:

1. Basic familiarization with colour, texture and 2 D design elements.
2. Interaction of colours, textures and planes
3. Colour, texture and cultural meaning
4. Abstraction and generation of texture, planar surfaces
5. Understanding balance, rhythm, expression using colours, textures, and planes.

Learning Strategy:

Studio based collaborative learning

Contact Period:

90 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks**:**

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 004 -Form and Space Studio (6 credits)

Class Outline:

This studio is designed to introduce to students the basics of working with 3-dimensional form and space. The emphasis of the course is also on the production of 3-dimensional form using a variety of materials, hard, soft, and or ephemeral

Learning Objectives:

1. To understand the generation and the language of 3 D form and space.
2. To understand the experience of 3 D Form and space from a manifold standpoints.
3. To understand the relationship between objects and the spaces they occupy and produce.
4. The relationship of human body in & to space.
5. The possibilities and limitations of materials to form.

Learning Strategy:

Studio based collaborative learning

Contact Period:

90 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 001 - Skills Workshop I: Wood, Metal and Clay (4 credits)

Class Outline:

This skills workshop is designed to familiarize students with basic working and skills of Clay, Metal and Wood. The Studio shall focus on working with these three materials starting from its rough, unprepared stage to a simple finished product.

Learning Objectives:

1. Understanding the nature of Wood, Metal and Clay.
2. Preparatory process of Wood, Metal and, Clay
3. Introduction to hand and machine-operated tools for Clay, Metal and Wood
4. Impart knowledge of basic production process of Clay, Wood and Metal.

Learning Strategy:

Studio based collaborative learning

Contact Period:

60 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 002 - Skills Workshop II: Textile and Fabric (4 credits)

Class Outline:

This skills workshop explores and introduces students the fundamental of fabrics and textiles, their production processes and the knowledge and understanding of functional and aesthetic requirements of textiles for a range of applications.

Learning Objectives:

1. Knowledge and understanding of the contextual textile, clothing and allied industries.
2. Appreciation of significance of textiles and craft in society
3. Practical skills in the production and manipulation of textile through use of appropriate means: weaving, knitting, printing, and embroidery.
4. Knowledge and Understanding of functional and aesthetic requirements of textiles for a range of applications.
5. Skills in experimentation, critical analysis and the discriminatory selection of textiles for specific end uses.

Learning Strategy:

Studio based collaborative learning

Contact Period:

60 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks**:**

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 003 –Skills Workshop III: Introduction to Computer Skills (4 credits)

Class Outline:

This skills workshop explores and introduces students the fundamentals of computer software, their application to design. The aim of this workshop is to ensure students undergo a survey of various computer applications that are available, understand the philosophical premise of the software, how professionals use them, and the scope and limitations of software.

Learning Objectives:

1. Knowledge and understanding of the contextual computer software..
2. Basic familiarization with AutoCAD, Adobe Photoshop, Adobe In Design, 3DS Max, Illustrator, and Flash
3. Knowledge and Understanding of functional and aesthetic requirements of design and the application of those in virtual environments.
4. Skills in experimentation, critical analysis and the discriminatory selection of computer software for specific end uses.

Learning Strategy:

Studio based collaborative learning

Contact Period:

60 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 004 – Skills Workshop IV: Free Hand Drawing Skills (4 credits)

Class Outline:

This skills workshop is designed to explore and learn the fundamental of sketching and communicating ideas quickly and effectively. .

Learning Objectives:

1. Demonstrate familiarity with basic drawing terms, tools, media and technique
2. Select frame and compose from reality to paper format
3. Recognise and manipulate negative / positive shapes and space with control variables
4. Perceive and utilize a full range of values for describing form, depth, structure while integrating these things into the forms surrounding space.
5. To understand line quality and its variations.
6. To understand Line quality and expressiveness.
7. Compose drawings
8. Use effective techniques to form objects and fragment them with environmental integration creating a sense of implies energy and motion .

Learning Strategy:

Studio based collaborative learning

Contact Period:

60 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 005: Skills Workshop V: Camera (4 credits)

Class Outline:

This skills workshop is designed to introduce the students to basic skills required to handle still and video camera. The overall aim is that the students not only familiarize themselves to the various technical aspects of the equipments abut also to instruct them on the concretization of the concepts through visual means.

Learning Objectives:

1. To demystify the process of filming and photography.
2. To instruct students in camera dynamics, that is, uses of different components and their camera interplay.
3. To instruct students in the basic principle skills of photography and filming.
4. To instruct students in camera movement, composition and creative use of lighting.

Learning Strategy:

Studio based collaborative learning

Contact Period:

60 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks**:**

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 006: Skills Workshop VI: Sound (4 credits)

Class Outline:

This skills workshop is designed to introduce the students to basic characteristics of sound, basic and proficient equipments, the technique of recording, reproducing and mixing.

Learning Objectives:

1. To train the students' ear for sound perception.
2. To familiarise the students with equipments of sound.
3. To train the students to be able to create sound perceptive.
4. To train the students to be able to create sound design for various media.

Learning Strategy:

Studio based collaborative learning

Contact Period:

60 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

RNCU 101–Freshman Writing Seminar (2 credits)

Class Outline

This course is designed to introduce the student to the methods and materials of academic writing. Through the use of reading journals, in-class writing exercises, homework, and essays, the course will explore a variety of ways to craft an essay, take notes on reading material, and respond critically to the material one reads.
This course has two components. The first is learning about the variety of essays one may write for academic and professional purposes. Examples of these are writing from experience, writing to compare, and writing about issues. The second is identifying themes common among the various essays we read.

Learning Objectives

1. The ability to read significant texts carefully and critically, recognizing and responding to argumentative positions.

2. The ability to write sustained, coherent and persuasive arguments on significant issues that arise from the content at hand.

3. The ability to write clearly, following the conventions of Standard English

Learning Strategy
Seminar based Enquiry

Contact Period
30

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

RNCU 102–Research Methods Seminar (2 credits)

Class Outline

This particular course is designed to function both as an introduction to questions of research and methodology as well as one which culminates in a seminar presentation of a particular topic. The course shall begin with an overview of what is research, why do research, what are the different kinds of research and then move on to specific exercises which will help you to answer questions like how do I find a topic, where do I find information on it, what do I do when I find it? Eventually one hopes that this course is able to bring us to a certain understanding of how one undertakes and brings to a successful fruition an academic research paper.

Learning Objectives

1. Understanding the questions of research

2. Introduction to different aspects of research such as, asking the right questions, framing the argument, listing sources, bibliography etc

3. Exposure to different sources of information and how to access them

Learning Strategy
Seminar based Enquiry

Contact Period
30

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARDR 101-Fundamentals of Drawing and Modelling- I(1 credit)

Class Outline:

The objective of this course is to enable the student to learn the proper tools and techniques of producing the various types of drawing and models which they will make use of n their professional career. This will include orthographic projections, shade shadow, basic rendering techniques.

Learning Objectives:

1. Introduction to simple 2 dimensional drawing elements, such as; line, point, plane
2. Introduction to orthographic projections- plans, section, and elevations.
3. Design of facades of simple and complex objects.
4. Basic shade and shadow of 2 Dimensional objects

Learning Strategy:

Studio based collaborative learning

Contact Period:

15 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks**:**

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARDR 102 -Fundamentals of Drawing and Modelling- II (1 credit)

Class Outline:

The objective of this course is to enable the student to learn the proper tools and techniques of producing the various types of drawing and models which they will make use of in their professional career. This will include isometric and perspectives projections, shade shadow, basic rendering techniques.

Learning Objectives:

1. Introduction to simple 3 dimensional drawing elements, such as; form, volume and space
2. Introduction to isometric projections from plans, section, and elevations.
3. 2 and 3 point perspective.
4. 3 dimensional modelling

Learning Strategy:

Studio based collaborative learning

Contact Period:

15 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks**:**

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARST 102 –Introduction to Structural Systems (3 credits)

Class Outline:

The aim of this course is to introduce students to the science and art of structural systems. Through a series of practical exercise participants will be familiarized with how structural systems and materials interact with each other. The objective here is to develop amongst students an appreciation of the various nuances involved in the both manmade and natural structures.

Learning Objectives:

1. Introduce students to various materials and their intrinsic properties.
2. Understand how various materials function when loaded
3. To understand how different materials interact with each other
4. To understand how structural systems work
5. To understand the aesthetic and social significance of building structures
6. To understand cell transformation, cell as a natural unit of space application of cellular systems in buildings and polyhedrality in architecture.

Learning Strategy:

Studio based collaborative learning

Contact Period:

45 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARSL 102 – Architectural Survey and Levelling (credits)

Class Outline:

The aim of this course is to introduce students to various techniques used in surveying areas for architectural and planning projects. . Through a series of practical exercise participants will be familiarized with how structural systems and materials interact with each other. The objective here is to develop amongst students an appreciation of the various nuances involved in the both manmade and natural structures.

Learning Objectives:

1. To introduce to students the history of surveying and levelling in India and the world
2. To understand the role of surveying and levelling in architecture and planning
3. Introduction to the various techniques and instruments of Surveying such as Chain, Plain Table Compas etc.
4. Introduction to various techniques and instruments of , such as theodolite, dumpy levels etc.
5. To introduce students to remote sensing GPS based method of surveying areas.

Learning Strategy:

Studio based collaborative learning

Contact Period:

36 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Major Curricula

ARDS 201- Architectural Design Studio: Mud, Brick & Stone (6 credits)

Class Outline:

The studio deals with design of structures with Mud, Brick & Stone as building materials. It looks at the language, the built expression and the design characteristics of these materials. It specifically engages with craft, vernacular architecture and alternative environments as exemplars of the use of these materials.

Learning Objectives:

6. Understanding the making and meaning of spaces and how spaces relate to one another
7. Understanding the language of Mud, Brick & Stone and its implication towards architectural design
8. Learn about the different design characteristics of Mud, Brick, and Stone
9. To begin to question the idea of "built expression" and "meaning" with respect to materials in architecture.
10. Initial exposure to craft, vernacular architecture and local environments.

Learning Strategy:

Studio based collaborative learning

Contact Period:

135 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARCS 201 - Architectural Construction Studio: Mud, Brick & Stone (4 credits)

Class Outline:

This Construction Studio is taught in conjunction with ARDS 201. Designed to work as a support to the main design studio, the class deals with the construction methods involving the use of Mud, Brick & Stone. The students are taught the construction basics of using these materials, the differing structural characteristics and the varying ways they are employed in the making of buildings. .

Learning Objectives:

1. Understanding the basic structural nature of Mud, Brick & Stone
2. Basic constructional details using Mud, Brick and Stone: from foundation to roofing, from walls to slabs, from structure to decoration.
3. The role of Mud, Brick & Stone in the construction industry today.

Learning Strategy:

Studio based collaborative learning

Contact Period:

77 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBS 201 - Architectural Building Services: Mud, Brick & Stone (2 credits)

Class outline:

In Conjunction with ARDS 201, this class will outline the requirements of Building Services and their application to buildings constructed with Mud, Brick & Stone. The main thrust of the module is to familiarize the students with basic building services that are necessary in a small-scale building. The student will also delve into the analysis of traditional modes of servicing a building, particularly in vernacular settings.

Learning Objectives:

1. Understanding the basic service requirements of buildings constructed with Mud, Brick and Stone.
2. Exploring the possibility of using Mud, Brick & Stone in building services.
3. Studying traditional modes of building services.

Learning Strategy:

Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBM 201 - Architectural Building Materials: Mud, Brick & Stone (2 credits)

Course Outline

In Conjunction with ARDS 201, the studio looks at Mud, Brick & Stone and examines their properties as basic building materials. It also involves the study of some other constituents of construction systems such as cement, lime, sand, mortar etc. Students are also expected to carry our studies of various traditional building materials and their relevance today.

Learning Objectives:

1. To understand the properties of Mud, Brick & Stone as building materials
2. To learn about other support materials are used in Mud, Brick and Stone Construction
3. To learn about the various kinds of Adobe, Brick and Stone available today.
4. To understand how and where Mud, Brick and Stone are produced.

Learning Strategy:

Seminar based Enquiry / Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARHA 201 - History of Architecture, Art & Culture: Mud, Brick & Stone (3 credits)

Class outline:

In Conjunction with ARDS 201, this module deals specifically with the socio-political, historical and cultural dimensions of Mud, Brick & Stone. It investigates the social, political, cultural and ecological aspects of these materials with a view towards constructing a holistic picture of building materials, their origins and implications. Through this module students develop a deeper understanding of the process of design and construction.

Learning Objectives:

1. To understand the historical development of Mud, Brick and Stone buildings
2. To understand the political economy of Mud, brick and Stone
3. To understand Cultural and Social significance of Mud, Brick and Stone
4. Developing an appreciation for building materials as socio-political and cultural symbols

Learning Strategy:

Seminar-based Enquiry / Studio based Collaborative Learning

Contact Period:

32 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARES 201 - Estimation, Costing & Specifications I (1 credit)

Class outline:

In Conjunction with ARDS 201, this module introduces students to the methods of estimation and costing with respect to Mud, Brick & Stone as building materials. Students are also familiarized with the specifications with respect to Mud, Brick & Stone in a building project. The module also strives to inculcate awareness regarding the factors affecting the cost of buildings.

Learning Objectives:

1. The students should be familiar with techniques of estimation used in small projects
2. Basic methods of costing and specifications with relation to Mud, Brick & Stone
3. Understand the idea behind estimation and specifications and the impact of materials on project costs

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

18 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

AREN 201 - Climatology, Environmental Studies & Landscape I (2 credits)

Class outline:

In Conjunction with ARDS 201, this module examines the link between the building materials and the environment. Specifically, it looks at Mud, Brick & Stone and their implications and associations with the environment, landscape and climatology. The module will discuss in depth the idea of sustainability with relation to these materials and their links with the larger environment and landscape.

Learning Objectives:

1. The interrelationship of Mud, Brick & Stone and the larger environment
2. Issues of sustainability and building materials
3. An understanding of Natural materials and building landscapes
4. Examining the broader link between the climate and building

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

16 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

<table>
<tr><td colspan="3">INTERNAL</td><td>EXTERNAL</td></tr>
<tr><td colspan="3">60 % (total marks assigned: 100)</td><td>40% (total marks assigned: 100)</td></tr>
<tr><td>Assessment 1 (Mid-term)</td><td>Continuous Assessment</td><td>Assessment 2 (End-term)</td><td>Assessment 2</td></tr>
<tr><td>Assessment levels: Internal Expert</td><td>Assessment levels: Internal Expert</td><td>Assessment levels: Internal Expert</td><td>Assessment levels: 1) External Expert</td></tr>
<tr><td>Total Marks Assigned: 20 out of 100</td><td>Total Marks Assigned: 50 out of 100</td><td>Total Marks Assigned: 30 out of 100</td><td>Total Marks Assigned: 100</td></tr>
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ARBL 201 - Building Bye Laws and Codes of Practices I (1 credit)

Class outline:

In Conjunction with ARDS 201, the primary intent of this module is to familiarize students with architectural controls, bye-laws and building codes especially with respect to building materials such as Mud, Brick & Stone. Students are also introduced to topical debates such as the need for legislation in the building industry and the need for building controls and regulations. The module also acquaints students with the submission and sanction process in India.

Learning Objectives:

1. Understand of the need for bye-laws and what is too much control
2. Be familiar with the role of various municipal bodies in the architectural profession
3. Recognize the relevance of building materials to different building codes
4. Acquaint the students with the sanction process

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

8 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARTD 201 – Design Studies (3 credits)

Class outline:

The idea behind this module is to examine how theorists of Design have talked about the question of design over the last two centuries.

Learning Objectives:

1. Understand the various themes through which Design has been theorized
2. Familiarize students with various movements within Art, Design, Culture, Politics that have exchanged ideas with Design
3. To develops a critique as well as one's own perspective on the question of Design

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

25 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARHS 201 - Human Settlements and the Vernacular Built Environment (2 credits)

Class outline:

In Conjunction with ARDS 201, the idea behind this module is to understand vernacular architecture as distinct from other historical and modern styles of architecture. The students are exposed to a wide variety of examples that teach them to appreciate that traditional styles are site responsive and an outcome of indigenous techniques and various social, economic and mythical values of society.

Learning Objectives:

1. To appreciate vernacular as a valid form of engagement with the built environment
2. To investigate the relevance of traditional building techniques today
3. To link the idea of sustainable living to traditional modes of building
4. To look at society as a determinant for design

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

30 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

<table>
<tr><td colspan="3">INTERNAL</td><td>EXTERNAL</td></tr>
<tr><td colspan="3">60 % (total marks assigned: 100)</td><td>40% (total marks assigned: 100)</td></tr>
<tr><td>Assessment 1 (Mid-term)</td><td>Continuous Assessment</td><td>Assessment 2 (End-term)</td><td>Assessment 2</td></tr>
<tr><td>Assessment levels: Internal Expert</td><td>Assessment levels: Internal Expert</td><td>Assessment levels: Internal Expert</td><td>Assessment levels: 1) External Expert</td></tr>
<tr><td>Total Marks Assigned: 20 out of 100</td><td>Total Marks Assigned: 50 out of 100</td><td>Total Marks Assigned: 30 out of 100</td><td>Total Marks Assigned: 100</td></tr>
</table>

ARST 201 –Architectural Structure II (3 credits)

Class outline:

In Conjunction with ARDS 201, the idea behind this module is to understand the basic principles of structural mechanics so that it forms the basis for study of structure systems. The students are exposed to a wide variety of examples that teach them to appreciate structural systems in traditional building styles. Through a series of practical exercise participants will be familiarized with how structural systems and materials interact with each other.

Learning Objectives:

1. To investigate types of masonry, different types of masonry units and structural members in masonry structures
2. To look at Types Of Stone, Structural Members used in Stone Structures, Types Of Stone Structures
3. To Understand Mud as a structural element, it's properties and constraints
4. To understand elements of statics, simple stress and strain in materials, centre of gravity & moment of inertia, shear force and bending moments,

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

45 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARDS 202- Architectural Design Studio: Timber & Fabric (6 credits)

Class Outline:

The studio deals with design of structures with Timber & Fabric as building materials. It looks at the language, the built expression and the design characteristics of these materials. It specifically engages with craft, vernacular architecture and alternative environments as exemplars of the use of these materials.

Learning Objectives:

1. Understanding the making and meaning of spaces and how spaces relate to one another
2. Understanding the language of Timber & Fabric and its implication towards architectural design
3. Learn about the different design characteristics of Timber & Fabric
4. To begin to question the idea of "built expression" and "meaning" with respect to materials in architecture.
5. Initial exposure to new-craft, contemporary architecture and local environments.

Learning Strategy:

Studio based collaborative learning

Contact Period:

135 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARCS 202 - Architectural Construction Studio: Timber & Fabric (4 credits)

Class Outline:

This Construction Studio is taught in conjunction with ARDS 202. Designed to work as a support to the main design studio, the class deals with the construction methods involving the use of Timber & Fabric. The students are taught the construction basics of using these materials, the differing structural characteristics and the varying ways they are employed in the making of buildings. .

Learning Objectives:

1. Understanding the basic structural nature of Timber & Fabric
2. Basic constructional details using Timber & Fabric: from foundation to roofing, from walls to slabs, from structure to decoration.
3. The role of Timber & Fabric in the construction industry today.

Learning Strategy:

Studio based collaborative learning

Contact Period:

77 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBS 202 - Architectural Building Services: Timber & Fabric (2 credits)

Class outline:

In Conjunction with ARDS 202, this class will outline the requirements of Building Services and their application to buildings constructed with Timber & Fabric. The main thrust of the module is to familiarize the students with basic building services that are necessary in a small-scale building. The student will also delve into the analysis of traditional modes of servicing a building, particularly in vernacular settings.

Learning Objectives:

1. Understanding the basic service requirements of buildings constructed with Timber & Fabric.
2. Exploring the possibility of using Timber & Fabric in building services.
3. Studying contemporary modes of building services.

Learning Strategy:

Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBM 202 - Architectural Building Materials: Timber & Fabric (2 credits)

Course Outline

In Conjunction with ARDS 202, the studio looks at Timber & Fabric and examines their properties as basic building materials. It also involves the study of some other constituents of construction systems such as cement, lime, sand, mortar etc. Students are also expected to carry our studies of various traditional building materials and their relevance today.

Learning Objectives:

1. To understand the properties of Timber & Fabric as building materials
2. To learn about other support materials are used in Timber & Fabric Construction
3. To learn about the various kinds of Timber & Fabric available today.
4. To understand how and where Timber & Fabric are produced.

Learning Strategy:

Seminar based Enquiry / Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARHA 202 - History of Architecture, Art & Culture: Timber & Fabric (3 credits)

Class outline:

In Conjunction with ARDS 202, this module deals specifically with the socio-political, historical and cultural dimensions of Timber & Fabric. It investigates the social, political, cultural and ecological aspects of these materials with a view towards constructing a holistic picture of building materials, their origins and implications. Through this module students develop a deeper understanding of the process of design and construction.

Learning Objectives:

1. To understand the historical development of Timber & Fabric buildings
2. To understand the political economy of Timber & Fabric
3. To understand Cultural and Social significance of Timber & Fabric
4. Developing an appreciation for building materials as socio-political and cultural symbols

Learning Strategy:

Seminar-based Enquiry / Studio based Collaborative Learning

Contact Period:

32 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert

Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARES 202 - Estimation, Costing & Specifications II (1 credit)

Class outline:

In Conjunction with ARDS 202, this module introduces students to the methods of estimation and costing with respect to Timber & Fabric as building materials. Students are also familiarized with the specifications with respect to Timber & Fabric in a building project. The module also strives to inculcate awareness regarding the factors affecting the cost of buildings.

Learning Objectives:

1. The students should be familiar with techniques of estimation used in small projects
2. Basic methods of costing and specifications with relation to Timber & Fabric
3. Understand the idea behind estimation and specifications and the impact of materials on project costs

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

18 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks	Total Marks	Total Marks	Total Marks Assigned:

Assigned: 20 out of 100	Assigned: 50 out of 100	Assigned: 30 out of 100	100

AREN 202 - Climatology, Environmental Studies & Landscape II (2 credits)

Class outline:

In Conjunction with ARDS 202, this module examines the link between the building materials and the environment. Specifically, it looks at Timber & Fabric and their implications and associations with the environment, landscape and climatology. The module will discuss in depth the idea of sustainability with relation to these materials and their links with the larger environment and landscape.

Learning Objectives:

1. The interrelationship of Timber & Fabric and the larger environment
2. Issues of sustainability and building materials
3. An understanding of Machine-made materials and building landscapes
4. Examining the broader link between the climate and building

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

16 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-	Continuous	Assessment 2 (End-	Assessment 2

term)	Assessment	term)	
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBL 202 - Building Bye Laws and Codes of Practices II (1 credit)

Class outline:

In Conjunction with ARDS 202, the primary intent of this module is to familiarize students with architectural controls, bye-laws and building codes especially with respect to building materials such as Timber & Fabric. Students are also introduced to topical debates such as the need for legislation in the building industry and the need for building controls and regulations. The module also acquaints students with the submission and sanction process in India.

Learning Objectives:

1. Understand of the need for bye-laws and what is too much control
2. Be familiar with the role of various municipal bodies in the architectural profession
3. Recognize the relevance of building materials to different building codes
4. Acquaint the students with the sanction process

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

8 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARST 202 – Architectural Structures III (3 credits)

Class outline:

In Conjunction with ARDS 202, the idea behind this module is to understand the basic principles of structural mechanics so that it forms the basis for study of structure systems. The students are exposed to a wide variety of examples that teach them to appreciate structural systems in traditional building styles. Through a series of practical exercise participants will be familiarized with how structural systems and materials interact with each other.

Learning Objectives:

1. To understand basic components such Timber, constituents of Timber Structures, its properties and limitationsetc
2. To investigate cables and fabrics as building materials and their properties, Types& Properties Of Cables, Different Type Of Posts, Different Types Of Anchorage, Fixing Of Cable, Post and Anchorage, Types Of Fabrics Used in Structures, Joints & erection of Fabric structures, Uses of Fabrics in Structures
3. To look at fundamentals & theory of structure design in Fabric Structures and High Strength Timber Structures

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

45 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARTD 202 - Design Studies II (3 credits)

Class outline:

In Conjunction with ARDS 202, the idea behind this module is to examine how theorists of Design have talked about the question of design over the last two centuries.

Learning Objectives:

1. Understand the various themes through which Design has been theorized
2. Familiarize students with various movements within Art, Design, Culture, Politics that have exchanged ideas with Design
3. To develops a critique as well as one's own perspective on the question of Design

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

25 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARDS 301- Architectural Design Studio: Concrete (6 credits)

Class Outline:

The studio deals with design of structures with Concrete as building materials. It looks at the language, the built expression and the design characteristics of these materials. It specifically engages with craft, vernacular architecture and alternative environments as exemplars of the use of these materials.

Learning Objectives:

1. Understanding the making and meaning of spaces and how spaces relate to one another
2. Understanding the language of Concrete and its implication towards architectural design
3. Learn about the different design characteristics of Concrete
4. To begin to question the idea of “built expression” and “meaning” with respect to materials in architecture.
5. Initial exposure to new-craft, contemporary architecture and local environments.

Learning Strategy:

Studio based collaborative learning

Contact Period:

135 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARCS 301 - Architectural Construction Studio: Concrete (4 credits)

Class Outline:

This Construction Studio is taught in conjunction with ARDS 301. Designed to work as a support to the main design studio, the class deals with the construction methods involving the use of Concrete. The students are taught the construction basics of using these materials, the differing structural characteristics and the varying ways they are employed in the making of buildings. .

Learning Objectives:

1. Understanding the basic structural nature of Concrete
2. Basic constructional details using Concrete: from foundation to roofing, from walls to slabs, from structure to decoration.
3. The role of Concrete in the construction industry today.

Learning Strategy:

Studio based collaborative learning

Contact Period:

77 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBS 301 - Architectural Building Services: Concrete (2 credits)

Class outline:

In Conjunction with ARDS 301, this class will outline the requirements of Building Services and their application to buildings constructed with Concrete. The main thrust of the module is to familiarize the students with basic building services that are necessary in a small-scale building. The student will also delve into the analysis of traditional modes of servicing a building, particularly in vernacular settings.

Learning Objectives:

1. Understanding the basic service requirements of buildings constructed with Concrete.
2. Exploring the possibility of using Concrete in building services.
3. Studying contemporary modes of building services.

Learning Strategy:

Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBM 301 - Architectural Building Materials: Concrete (2 credits)

Course Outline

In Conjunction with ARDS 301, the studio looks at Concrete and examines their properties as basic building materials. It also involves the study of some other constituents of construction systems such as cement, lime, sand, mortar etc. Students are also expected to carry our studies of various traditional building materials and their relevance today.

Learning Objectives:

1. To understand the properties of Concrete as building materials
2. To learn about other support materials are used in Concrete Construction
3. To learn about the various kinds of Concrete available today.
4. To understand how and where Concrete are produced.

Learning Strategy:

Seminar based Enquiry / Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARHA 301 - History of Architecture, Art & Culture: Concrete (3 credits)

Class outline:

In Conjunction with ARDS 301, this module deals specifically with the socio-political, historical and cultural dimensions of Concrete. It investigates the social, political, cultural and ecological aspects of these materials with a view towards constructing a holistic picture of building materials, their origins and implications. Through this module students develop a deeper understanding of the process of design and construction.

Learning Objectives:

1. To understand the historical development of Concrete buildings
2. To understand the political economy of Concrete
3. To understand Cultural and Social significance of Concrete
4. Developing an appreciation for building materials as socio-political and cultural symbols

Learning Strategy:

Seminar-based Enquiry / Studio based Collaborative Learning

Contact Period:

32 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARES 301 - Estimation, Costing & Specifications III (1 credit)

Class outline:

In Conjunction with ARDS 301, this module introduces students to the methods of estimation and costing with respect to Concrete as building materials. Students are also familiarized with the specifications with respect to Concrete in a building project. The module also strives to inculcate awareness regarding the factors affecting the cost of buildings.

Learning Objectives:

1. The students should be familiar with techniques of estimation used in small projects
2. Basic methods of costing and specifications with relation to Concrete
3. Understand the idea behind estimation and specifications and the impact of materials on project costs

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

18 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

AREN 301 - Climatology, Environmental Studies & Landscape III (2 credits)

Class outline:

In Conjunction with ARDS 301, this module examines the link between the building materials and the environment. Specifically, it looks at Concrete and their implications and associations with the environment, landscape and climatology. The module will discuss in depth the idea of sustainability with relation to these materials and their links with the larger environment and landscape.

Learning Objectives:

1. The interrelationship of Concrete and the larger environment
2. Issues of sustainability and building materials
3. An understanding of Machine-made materials and building landscapes
4. Examining the broader link between the climate and building

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

16 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBL 301 - Building Bye Laws and Codes of Practices III (1 credit)

Class outline:

In Conjunction with ARDS 301, the primary intent of this module is to familiarize students with architectural controls, bye-laws and building codes especially with respect to building materials such as Concrete. Students are also introduced to topical debates such as the need for legislation in the building industry and the need for building controls and regulations. The module also acquaints students with the submission and sanction process in India.

Learning Objectives:

1. Understand of the need for bye-laws and what is too much control
2. Be familiar with the role of various municipal bodies in the architectural profession
3. Recognize the relevance of building materials to different building codes
4. Acquaint the students with the sanction process

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

8 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARST 301 – Architectural Structures IV (3 credits)

Class outline:

In Conjunction with ARDS 201, the idea behind this module is to understand the basic principles of structural mechanics so that it forms the basis for study of structure systems. The students are exposed to a wide variety of examples that teach them to appreciate structural systems in traditional building styles. Through a series of practical exercise participants will be familiarized with how structural systems and materials interact with each other.

Learning Objectives:

1. To be familiar with types of concrete, PCC, RCC
2. To understand basic components such as Column & Beam Structures, Slabs (One way, Two way, Flat Slab, Coffer Slab etc.), Portal Frames, Folded Platesetc
3. To investigate materials and their properties,Precast Concrete structures, Pre-stressed Concrete Structures, Construction techniques of Precast & Pre-stressed Concrete Structures, Use of Pre cast & Pre-stressed Concrete Structures
4. To look at fundamentals & theory of structure design in Concrete Structures and Steel Structures

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

45 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARDS 302- Architectural Design Studio: Glass & Steel (6 credits)

Class Outline:

The studio deals with design of structures with Glass & Steel as building materials. It looks at the language, the built expression and the design characteristics of these materials. It specifically engages with craft, vernacular architecture and alternative environments as exemplars of the use of these materials.

Learning Objectives:

1. Understanding the making and meaning of spaces and how spaces relate to one another
2. Understanding the language of Glass & Steel and its implication towards architectural design
3. Learn about the different design characteristics of Glass & Steel
4. To begin to question the idea of “built expression” and “meaning” with respect to materials in architecture.
5. Initial exposure to new-craft, contemporary architecture and local environments.

Learning Strategy:

Studio based collaborative learning

Contact Period:

135 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARCS 302 - Architectural Construction Studio: Glass & Steel (4 credits)

Class Outline:

This Construction Studio is taught in conjunction with ARDS 302. Designed to work as a support to the main design studio, the class deals with the construction methods involving the use of Glass & Steel. The students are taught the construction basics of using these materials, the differing structural characteristics and the varying ways they are employed in the making of buildings. .

Learning Objectives:

1. Understanding the basic structural nature of Glass & Steel
2. Basic constructional details using Glass & Steel: from foundation to roofing, from walls to slabs, from structure to decoration.
3. The role of Glass & Steel in the construction industry today.

Learning Strategy:

Studio based collaborative learning

Contact Period:

77 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBS 302 - Architectural Building Services: Glass & Steel(2 credits)

Class outline:

In Conjunction with ARDS 302, this class will outline the requirements of Building Services and their application to buildings constructed with Glass & Steel. The main thrust of the module is to familiarize the students with basic building services that are necessary in a small-scale building. The student will also delve into the analysis of traditional modes of servicing a building, particularly in vernacular settings.

Learning Objectives:

1. Understanding the basic service requirements of buildings constructed with Glass & Steel.
2. Exploring the possibility of using Glass & Steel in building services.
3. Studying contemporary modes of building services.

Learning Strategy:

Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBM 302 - Architectural Building Materials: Glass & Steel (2 credits)

Course Outline

In Conjunction with ARDS 302, the studio looks at Glass & Steel and examines their properties as basic building materials. It also involves the study of some other constituents of construction systems such as cement, lime, sand, mortar etc. Students are also expected to carry our studies of various traditional building materials and their relevance today.

Learning Objectives:

1. To understand the properties of Glass & Steel as building materials
2. To learn about other support materials are used in Glass & Steel Construction
3. To learn about the various kinds of Glass & Steel available today.
4. To understand how and where Glass & Steel are produced.

Learning Strategy:

Seminar based Enquiry / Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARHA302 - History of Architecture, Art & Culture: Glass & Steel (3 credits)

Class outline:

In Conjunction with ARDS 302, this module deals specifically with the socio-political, historical and cultural dimensions of Glass & Steel. It investigates the social, political, cultural and ecological aspects of these materials with a view towards constructing a holistic picture of building materials, their origins and implications. Through this module students develop a deeper understanding of the process of design and construction.

Learning Objectives:

1. To understand the historical development of Glass & Steel buildings
2. To understand the political economy of Glass & Steel
3. To understand Cultural and Social significance of Glass & Steel
4. Developing an appreciation for building materials as socio-political and cultural symbols

Learning Strategy:

Seminar-based Enquiry / Studio based Collaborative Learning

Contact Period:

32 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARES 302 - Estimation, Costing & Specification IV (1 credit)

Class outline:

In Conjunction with ARDS 302, this module introduces students to the methods of estimation and costing with respect to Glass & Steel as building materials. Students are also familiarized with the specifications with respect to Glass & Steel in a building project. The module also strives to inculcate awareness regarding the factors affecting the cost of buildings.

Learning Objectives:

1. The students should be familiar with techniques of estimation used in small projects
2. Basic methods of costing and specifications with relation to Glass & Steel
3. Understand the idea behind estimation and specifications and the impact of materials on project costs

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

18 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

AREN 302 - Climatology, Environmental Studies & Landscape IV (2 credits)

Class outline:

In Conjunction with ARDS 302, this module examines the link between the building materials and the environment. Specifically, it looks at Glass & Steel and their implications and associations with the environment, landscape and climatology. The module will discuss in depth the idea of sustainability with relation to these materials and their links with the larger environment and landscape.

Learning Objectives:

1. The interrelationship of Glass & Steel and the larger environment
2. Issues of sustainability and building materials
3. An understanding of Machine-made materials and building landscapes
4. Examining the broader link between the climate and building

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

16 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBL 302 - Building Bye Laws and Codes of Practices IV (1 credit)

Class outline:

In Conjunction with ARDS 302, the primary intent of this module is to familiarize students with architectural controls, bye-laws and building codes especially with respect to building materials such as Glass & Steel. Students are also introduced to topical debates such as the need for legislation in the building industry and the need for building controls and regulations. The module also acquaints students with the submission and sanction process in India.

Learning Objectives:

1. Understand of the need for bye-laws and what is too much control
2. Be familiar with the role of various municipal bodies in the architectural profession
3. Recognize the relevance of building materials to different building codes
4. Acquaint the students with the sanction process

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

8 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARST 302 –Architectural Structures V (3 credits)

Class outline:

In Conjunction with ARDS 202, the idea behind this module is to understand the basic principles of structural mechanics so that it forms the basis for study of structure systems. The students are exposed to a wide variety of examples that teach them to appreciate structural systems in contemporary building styles. Through a series of practical exercise participants will be familiarized with how structural systems and materials interact with each other. The objective here is to develop amongst students an appreciation of the various nuances involved in the both manmade and natural structures.

Learning Objectives:

1. To understand Triangulation, Trusses (Plane &Vierendeel Truss), Curved Truss Systems, Space Frames, Geodesic Domes etc
2. To investigate materials and their properties, types of steel members, structural members used in steel structures, types of steel structure.
3. To investigate to role of glass in a building structures, structural glazing, etc
4. To look at fundamentals & theory of structure design in Steel Structures and Glass Structures

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

45 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

In the First Semester of the Fourth Year, students are given the option of choosing from the following:

1. **Renewable Materials studio**
2. **Low-cost Materials studio**

They may also choose to do any Studio and its corresponding Seminar courses offered by the School of Art, Design and Media Studies.

ARDS 401- Architectural Design Studio: Renewable Materials (6 credits)

Class Outline:

The studio deals with design of structures with Renewable Materials as building materials. It looks at the language, the built expression and the design characteristics of these materials. It specifically engages with craft, vernacular architecture and alternative environments as exemplars of the use of these materials.

Learning Objectives:

1. Understanding the making and meaning of spaces and how spaces relate to one another
2. Understanding the language of Renewable Materials and its implication towards architectural design
3. Learn about the different design characteristics of Renewable Materials
4. To begin to question the idea of "built expression" and "meaning" with respect to materials in architecture.
5. Initial exposure to new-craft, contemporary architecture and local environments.

Learning Strategy:

Studio based collaborative learning

Contact Period:

135 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL	EXTERNAL
60 % (total marks assigned: 100)	40% (total marks assigned: 100)

Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARCS 401 - Architectural Construction Studio: Renewable Materials (4 credits)

Class Outline:

This Construction Studio is taught in conjunction with ARDS 401. Designed to work as a support to the main design studio, the class deals with the construction methods involving the use of Renewable Materials. The students are taught the construction basics of using these materials, the differing structural characteristics and the varying ways they are employed in the making of buildings. .

Learning Objectives:

1. Understanding the basic structural nature of Renewable Materials
2. Basic constructional details using Renewable Materials: from foundation to roofing, from walls to slabs, from structure to decoration.
3. The role of Renewable Materials in the construction industry today.

Learning Strategy:

Studio based collaborative learning

Contact Period:

77 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2

Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBS 401- Architectural Building Services: Renewable Materials (2 credits)

Class outline:

In Conjunction with ARDS 401, this class will outline the requirements of Building Services and their application to buildings constructed with Renewable Materials. The main thrust of the module is to familiarize the students with basic building services that are necessary in a small-scale building. The student will also delve into the analysis of traditional modes of servicing a building, particularly in vernacular settings.

Learning Objectives:

1. Understanding the basic service requirements of buildings constructed with Renewable Materials.
2. Exploring the possibility of using Renewable Materials in building services.
3. Studying contemporary modes of building services.

Learning Strategy:

Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBM 401- Architectural Building Materials: Renewable Materials(2 credits)

Course Outline

In Conjunction with ARDS 401, the studio looks at Renewable Materials and examines their properties as basic building materials. It also involves the study of some other constituents of construction systems such as cement, lime, sand, mortar etc. Students are also expected to carry our studies of various traditional building materials and their relevance today.

Learning Objectives:

1. To understand the properties of Renewable Materials as building materials
2. To learn about other support materials are used in Renewable Materials Construction
3. To learn about the various kinds of Renewable Materials available today.
4. To understand how and where Renewable Materials are produced.

Learning Strategy:

Seminar based Enquiry / Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARHA 401 - History of Architecture, Art & Culture: Renewable Materials (3 credits)

Class outline:

In Conjunction with ARDS 401, this module deals specifically with the socio-political, historical and cultural dimensions of Renewable Materials. It investigates the social, political, cultural and ecological aspects of these materials with a view towards constructing a holistic picture of building materials, their origins and implications. Through this module students develop a deeper understanding of the process of design and construction.

Learning Objectives:

1. To understand the historical development of Renewable Materials buildings
2. To understand the political economy of Renewable Materials
3. To understand Cultural and Social significance of Renewable Materials
4. Developing an appreciation for building materials as socio-political and cultural symbols

Learning Strategy:

Seminar-based Enquiry / Studio based Collaborative Learning

Contact Period:

32 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARES 401 - Estimation, Costing & Specifications: Renewable Materials (1 credit)

Class outline:

In Conjunction with ARDS 401, this module introduces students to the methods of estimation and costing with respect to Renewable Materials as building materials. Students are also familiarized with the specifications with respect to Renewable Materials in a building project. The module also strives to inculcate awareness regarding the factors affecting the cost of buildings.

Learning Objectives:

1. The students should be familiar with techniques of estimation used in small projects
2. Basic methods of costing and specifications with relation to Renewable Materials
3. Understand the idea behind estimation and specifications and the impact of materials on project costs

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

18 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

AREN 401 - Climatology, Environmental Studies & Landscape: Renewable Materials (2 credits)

Class outline:

In Conjunction with ARDS 401, this module examines the link between the building materials and the environment. Specifically, it looks at Renewable Materials and their implications and associations with the environment, landscape and climatology. The module will discuss in depth the idea of sustainability with relation to these materials and their links with the larger environment and landscape.

Learning Objectives:

1. The interrelationship of Renewable Materials and the larger environment
2. Issues of sustainability and building materials
3. An understanding of Machine-made materials and building landscapes
4. Examining the broader link between the climate and building

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

16 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBL 401 - Building Bye Laws and Codes of Practices: Renewable Materials (1 credit)

Class outline:

In Conjunction with ARDS 401, the primary intent of this module is to familiarize students with architectural controls, bye-laws and building codes especially with respect to building materials such as Renewable Materials. Students are also introduced to topical debates such as the need for legislation in the building industry and the need for building controls and regulations. The module also acquaints students with the submission and sanction process in India.

Learning Objectives:

1. Understand of the need for bye-laws and what is too much control
2. Be familiar with the role of various municipal bodies in the architectural profession
3. Recognize the relevance of building materials to different building codes
4. Acquaint the students with the sanction process

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

8 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARDS 401- Architectural Design Studio: Low-cost Materials (6 credits)

Class Outline:

The studio deals with design of structures with Low-cost Materials as building materials. It looks at the language, the built expression and the design characteristics of these materials. It specifically engages with craft, vernacular architecture and alternative environments as exemplars of the use of these materials.

Learning Objectives:

1. Understanding the making and meaning of spaces and how spaces relate to one another
2. Understanding the language of Low-cost Materials and its implication towards architectural design
3. Learn about the different design characteristics of Low-cost Materials
4. To begin to question the idea of “built expression” and “meaning” with respect to materials in architecture.
5. Initial exposure to new-craft, contemporary architecture and local environments.

Learning Strategy:

Studio based collaborative learning

Contact Period:

135 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARCS 401 - Architectural Construction Studio: Low-cost Materials (4 credits)

Class Outline:

This Construction Studio is taught in conjunction with ARDS 401. Designed to work as a support to the main design studio, the class deals with the construction methods involving the use of Low-cost Materials. The students are taught the construction basics of using these materials, the differing structural characteristics and the varying ways they are employed in the making of buildings. .

Learning Objectives:

1. Understanding the basic structural nature of Low-cost Materials
2. Basic constructional details using Low-cost Materials: from foundation to roofing, from walls to slabs, from structure to decoration.
3. The role of Low-cost Materials in the construction industry today.

Learning Strategy:

Studio based collaborative learning

Contact Period:

77 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL	EXTERNAL
60 % (total marks assigned: 100)	40% (total marks assigned: 100)

Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBS 401- Architectural Building Services: Low-cost Materials (2 credits)

Class outline:

In Conjunction with ARDS 401, this class will outline the requirements of Building Services and their application to buildings constructed with Low-cost Materials. The main thrust of the module is to familiarize the students with basic building services that are necessary in a small-scale building. The student will also delve into the analysis of traditional modes of servicing a building, particularly in vernacular settings.

Learning Objectives:

1. Understanding the basic service requirements of buildings constructed with Low-cost Materials.
2. Exploring the possibility of using Low-cost Materials in building services.
3. Studying contemporary modes of building services.

Learning Strategy:

Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL	EXTERNAL

60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBM 401- Architectural Building Materials: Low-cost Materials (2 credits)

Course Outline

In Conjunction with ARDS 401, the studio looks at Low-cost Materials and examines their properties as basic building materials. It also involves the study of some other constituents of construction systems such as cement, lime, sand, mortar etc. Students are also expected to carry our studies of various traditional building materials and their relevance today.

Learning Objectives:

1. To understand the properties of Low-cost Materials as building materials
2. To learn about other support materials are used in Low-cost Materials Construction
3. To learn about the various kinds of Low-cost Materials available today.
4. To understand how and where Low-cost Materials are produced.

Learning Strategy:

Seminar based Enquiry / Studio based collaborative learning

Contact Period:

23 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARHA 401 - History of Architecture, Art & Culture: Low-cost Materials (3 credits)

Class outline:

In Conjunction with ARDS 401, this module deals specifically with the socio-political, historical and cultural dimensions of Low-cost Materials. It investigates the social, political, cultural and ecological aspects of these materials with a view towards constructing a holistic picture of building materials, their origins and implications. Through this module students develop a deeper understanding of the process of design and construction.

Learning Objectives:

1. To understand the historical development of Low-cost Materials buildings
2. To understand the political economy of Low-cost Materials
3. To understand Cultural and Social significance of Low-cost Materials
4. Developing an appreciation for building materials as socio-political and cultural symbols

Learning Strategy:

Seminar-based Enquiry / Studio based Collaborative Learning

Contact Period:

32 Contact Periods

Form of Evaluation:

Term Paper/ Report, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARES 401 - Estimation, Costing & Specifications: Low-cost Materials (1 credit)
Class outline:

In Conjunction with ARDS 401, this module introduces students to the methods of estimation and costing with respect to Low-cost Materials as building materials. Students are also familiarized with the specifications with respect to Low-cost Materials in a building project. The module also strives to inculcate awareness regarding the factors affecting the cost of buildings.

Learning Objectives:

1. The students should be familiar with techniques of estimation used in small projects
2. Basic methods of costing and specifications with relation to Low-cost Materials
3. Understand the idea behind estimation and specifications and the impact of materials on project costs

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

18 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

AREN 401 - Climatology, Environmental Studies & Landscape: Low-cost Materials (2 credits)

Class outline:

In Conjunction with ARDS 401, this module examines the link between the building materials and the environment. Specifically, it looks at Low-cost Materials and their implications and associations with the environment, landscape and climatology. The module will discuss in depth the idea of sustainability with relation to these materials and their links with the larger environment and landscape.

Learning Objectives:

1. The interrelationship of Low-cost Materials and the larger environment
2. Issues of sustainability and building materials
3. An understanding of Machine-made materials and building landscapes
4. Examining the broader link between the climate and building

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

16 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARBL 401 - Building Bye Laws and Codes of Practices: Low-cost Materials (1 credit)

Class outline:

In Conjunction with ARDS 401, the primary intent of this module is to familiarize students with architectural controls, bye-laws and building codes especially with respect to building materials such as Low-cost Materials. Students are also introduced to topical debates such as the need for legislation in the building industry and the need for building controls and regulations. The module also acquaints students with the submission and sanction process in India.

Learning Objectives:

1. Understand of the need for bye-laws and what is too much control
2. Be familiar with the role of various municipal bodies in the architectural profession
3. Recognize the relevance of building materials to different building codes
4. Acquaint the students with the sanction process

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

8 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARST 401–Advanced Architectural Structures VI (3 credits)

Class outline:

In Conjunction with ARDS 401, the idea behind this module is to understand the basic principles of structural mechanics so that it forms the basis for study of structure systems. The students are exposed to a wide variety of examples that teach them to appreciate structural systems in alternative building styles. Through a series of practical exercise participants will be familiarized with how structural systems and materials interact with each other. The objective here is to develop amongst students an appreciation of the various nuances involved in the both manmade and natural structures.

Learning Objectives:

1. To understand basic components such as Cable Systems, Pneumatic Structures etc
2. To investigate materials and their properties, Types Of High Strength Concrete, Design, Manufacturing and erection Of Pre cast & Pre-stressed members, Curved Shells, Folded Plates, Prismatic and pyramidal folded structure systems, Rotational Shell Systems, Anticlastic Shell Systems.
3. To look at fundamentals & theory of structure design in Design Of Suspension Bridges, Design Of Cable Stayed Roofs, Design Of Pneumatic Systems

Learning Strategy:

Seminar-based Enquiry / Studio based collaborative learning

Contact Period:

45 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARDS 402- Architectural Design Studio: Thesis Studio (12 credits)
Class Outline:

This Studio deals with the execution of a singular design or design-related project selected by the individual student. The project is based on independent research and preliminary design work and is of sufficient depth and breadth to display a mastery of design skills and comprehensive understanding of the architectural issues related to form, process, judgment, representation, and communication. The work is done under the guidance of a thesis advisor chosen by the student.

Learning Objectives:

1. Display a mastery of the process of defining an architectural problem
2. Investigation and discussion of the procedural, physical, and intellectual limits of this problem
3. generation of all contextual information and design strategies necessary
4. To understand the advanced materials and construction systems to energy-conserving materials.
5. Investigate issues, or topics related to architectural design and its associated disciplines, such as urban, landscape, interior, and visual design.

Learning Strategy:

Studio based collaborative learning

Contact Period:

135 Contact Periods

Form of Evaluation:

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARPP 501: Professional Practice in Architecture

Class outline:

In conjunction with the Internship year, the primary intent of this module is to investigate into the issues related to the professional practice of architecture in contemporary society. Topics include project management, finance and economics; business and practice management; and laws and regulations governing the profession.

Learning Objectives:

1. Understand and apply knowledge learned in the classroom and to bring practical experience to bear on their graduate studies
2. Develop a bridge between their academic experience and professional practice
3. Recognize the relevance of practice in architecture
4. Acquaint the students with the profession of architecture

Learning Strategy:

Seminar-based Enquiry

Contact Period:

60 Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SOCS/HUMA/MGMT 000: Social Sciences, Humanities and Management Electives

Class Outline:

Social Sciences, Humanities and Management Electives are designed to allow instructors to present classes that explore disciplinary and discursive exchanges between architecture and the Liberal Arts that have been central to the production of the architectural imaginary.

Given that architecture is a scientific-artistic discipline with profound social implications, the architect it is argued, can only progress in tandem with the findings of these variegated disciplines. Within the larger imagination of architecture there is a strong belief amongst architects as well, that the findings, methods and theories of the liberal arts and allied fields inform the study and practice of architecture. Consequently, students of architecture, the world over, are provided with courses in sociology, history, climatology, and acoustics and so on.

Learning Objectives:

1. To inculcate in the students an appreciation for the interdisciplinary nature of architecture
2. Understand the role of liberal arts in everyday life
3. Look at Social Sciences, Humanities and Management as an extension of the discipline of architecture

Learning Strategy:

Seminar-based Enquiry

Contact Period:

Contact Periods

Form of Evaluation:

Term Papers

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARSP 100: 1st Year Summer: Reserved Study Programme

Class outline:

The Reserved Study Programme is a special out-station field-work based research programme conducted during the summer break after the completion of the Foundation year. Students go on a week-long field trip where they carry out first-hand surveys, make measured drawings, conduct interviews, and other field work required for the programme. On their return, the group prepares a dossier of all their field work and findings in the form of a report.

Learning Objectives:

1. Understand of the need for field work
2. Be familiar with measured drawings and surveys
3. Investigate ideas of society, culture, space and place through firsthand experience
4. Acquaint the students with different peoples

Learning Strategy:

Field work based learning

Contact Period:

Form of Evaluation:

Term Paper/ Project

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARIN 200: 2nd Year Summer: Internship Programme

Class outline:

The internship is a two month long work-experience programme conducted in the summer after the second year of the course. Students are attached to different architectural and built-environment practices to gain real-world experience and exposure to what kind of work goes into the practice of architecture.

Learning Objectives:

1. Understand of the demands of a workplace
2. Be familiar with the variety in architectural practice
3. Compare the experiences of academic studios with the actual practice of architecture
4. Acquaint the students with different kinds of practices

Learning Strategy:

Architectural practice based learning

Contact Period:

Contact Periods

Form of Evaluation:

Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

AREP 300: 3rd Year Summer: Elective Summer Project

Class outline:

The Elective Summer Project is an exchange programme or a collective project that is carried out in conjunction and partnership with a national or international college/university. Students from both universities will carry out a joint research project over two months in the summer after the third year of the course.

Learning Objectives:

1. Learn to work in a multicultural environment
2. Be familiar with a variety of places and peoples
3. Learn to work as a team
4. Acquaint the students with different kinds of studio and learning practices

Learning Strategy:

Field work based learning

Contact Period:

Contact Periods

Form of Evaluation:

Term Paper, Jury Presentation

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Annexure-VI-B of Agenda Item no. 6.5

Course and Credit Distribution (MA in Habitat Studies):

	LEVEL 1			LEVEL 2	
	Fall	Spring		Fall	Spring
Pro-Seminar	1 Class (3 credits)	1 Class (3 credits)			
Research Module		1 Class (3 credits)			
Major Seminar	2 Classes (6 credits)		Summer Break		
Colloquium				1 Class (3 credits)	
Supervised Independent Study	1 Class (3 credits)	2 Classes (6 credits)		1 Class (3 credits)	
Thesis				1 Class (6 credits)	1 Class (12 credits)
Total Credits	12 credits	12 credits		12 credits	12 credits
Contact Hours	180	180		180	180

ARPS 601 – Built Environment Analysis Method Pro-Seminar – I (3 credits)

Class Outline:

This course seeks to give students an overview of the use and history of methods that have been used to analyze the Built Environment and the opportunity to practice hands on analysis of the built environment. On the one hand, the course will critically examine various methodological approaches that have been prominent in institutionalizing the analysis of the built environment over the last two centuries. These methods will be addressed contextually, as embedded within the sociological, historical and cultural milieu of built environment practice, the academia and the authors themselves. On the other hand, we shall be using the insights from our own discussions to actually engage in some analysis of the built environment around particular artifacts of our choosing.

Learning Objectives:

1. Understanding the how to address various theories of built environment analysis
2. Go over themes within architectural analysis: formalism, iconography, semiotics, Marxism, feminism, postcolonial/subaltern theory, post structuralism and deconstruction, psychoanalysis and hermeneutics
3. Have the ability to research the architectural object critically and to extend understandings of the built environment

Learning Strategy:
Seminar based Enquiry

Contact Period:
45 Contact Periods

Form of Evaluation:
Term Paper

Method of Evaluation:
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARMS 601a – Postcolonial and South Asian Studies Seminar (3 credits)

Class Outline:

This is an interdisciplinary introduction to the cultures and histories of South Asia, with special attention to religion, political authority, and the arts, as well as problems connected to gender and development. We look briefly at South Asian migration as well. Many sections of the course focus on questions of identity and belonging, looking at how people do, and have, express(ed) their relationship to places and social groups. Student assignments will allow you to explore matters of particular interest, against the backdrop of collective readings, lectures, and discussions.

Learning Objectives:

1. Understanding the how the built environment has developed in the South-Asian Context
2. Look at the built environment as an interdisciplinary field of inquiry
3. Examine the disciplinary boundaries of the built environment

Learning Strategy:

Seminar based Enquiry

Contact Period:

45 Contact Periods

Form of Evaluation:

Term Paper

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARMS 601b – The Narratives of Modernity Pro-Seminar (3 credits)

Class Outline:

This seminar aims to introduce students to various theoretical approaches over the last two centuries that have conceptualized the question of modernity and subsequently post modernity. Given the overall emphasis of the course on an interdisciplinary study of the built environment, this particular class shall especially look at those theories which have had a profound effect in shaping the built environment. .

Learning Objectives:

1. Understanding what we mean when speak of ourselves as being modern
2. What makes modernity distinctive from other spaces and times
3. Understanding how concepts of modernity/ postmodernity etc have affected the built environment.

Learning Strategy:

Seminar based Enquiry

Contact Period:

45 Contact Periods

Form of Evaluation:

Term Paper

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARPS 602 – Built Environment Analysis Method Pro-Seminar – II (3 credits)

Class Outline:

This course seeks to give students an overview of the use and history of methods that have been used to analyze the Built Environment and the opportunity to practice hands on analysis of the built environment. On the one hand, the course will critically examine various methodological approaches that have been prominent in institutionalizing the analysis of the built environment over the last two centuries. These methods will be addressed contextually, as embedded within the sociological, historical and cultural milieu of built environment practice, the academia and the authors themselves. On the other hand, we shall be using the insights from our own discussions to actually engage in some analysis of the built environment around particular artifacts of our choosing.

Learning Objectives:

1. Understanding the how to address various theories of built environment analysis
2. Go over themes within architectural analysis: formalism, iconography, semiotics, Marxism, feminism, postcolonial/subaltern theory, poststructuralism and deconstruction, psychoanalysis and hermeneutics
3. Have the ability to research the architectural object critically and to extend understandings of the built environment

Learning Strategy:
Seminar based Enquiry

Contact Period:
45 Contact Periods

Form of Evaluation:
Term Paper

Method of Evaluation:
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARRD 602 – Research Methods Pro-Seminar (3 credits)

Class Outline:

This particular course is designed to function both as an introduction to questions of research and methodology as well as one which culminates in a seminar presentation of a particular topic. The course shall begin with an overview of what is research, why do research, what are the different kinds of research and then move on to specific exercises which will help you to answer questions like how do I find a topic, where do I find information on it, what do I do when I find it? Eventually one hopes that this course is able to bring us to a certain understanding of how one undertakes and brings to a successful fruition an academic research paper.

Learning Objectives:

1. Understanding the questions of research
2. Introduction to different aspects of research such as, asking the right questions, framing the argument, listing sources, bibliography etc
3. Exposure to different sources of information and how to access them

Learning Strategy:

Seminar based Enquiry

Contact Period:

45 Contact Periods

Form of Evaluation:

Term Paper

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARCQ 701 – Colloquium (3 credits)

Class Outline:

The Architecture Research Colloquium (ARCO) is a semester long lecture series organised by the MA students and faculty in the Department of Architecture. The goal of the colloquium is to invite advanced PhD Candidates, faculty, and scholars engaged in inquiry related to the broadly conceived discipline of architecture to present ongoing work.

Learning Objectives:

1. Exposure to different aspects of research and inquiry
2. A platform for interaction with the larger fraternity
3. Understand the current issues that face the discipline

Learning Strategy:

Seminar based Enquiry

Contact Period:

45 Contact Periods

Form of Evaluation:

Term Paper

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARTH 701/ARTH 702 – Research Design Thesis (6+12 credits)

Class Outline:

The thesis is the largest and most significant component of students' work within the overall MA structure. The choice of topic, the organisation of research and the development of the central argument are all organised within the Research Methods Pro-seminar which takes place in term 2. This may be supplemented by individual tutorials, but central to the development of the thesis is the collective seminar. In this way, students are provided with an invaluable tool in learning about the nature of a dissertation from the shared experiences of the group.

Learning Objectives:

1. Organisation of research and the development of the central argument
2. Working independently on a independent, researched, scholarly body of work
3. Learn to work with various kinds of sources

Learning Strategy:

Individual Research based Enquiry

Contact Period:

270 contact periods

Form of Evaluation:

Term Paper

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARIS 601/602/701– Supervised Independent Study (3+6+3 credits)

Class Outline:

The Supervised Independent Study is a module which is individually tailored by the students to their own area of interest. They may choose any distinguished academic or professional working from within the University or outside as a mentor, and carry-out a reading schedule in a particular area of interest under their guidance. This particular module runs for the first 3 terms of the MA.

Learning Objectives:

1. To be decided individually for each student, in consultation with the Mentor and the Department Supervisor.

Learning Strategy:

Individual Research based Enquiry

Contact Period:

180 Contact Periods

Form of Evaluation:

Term Paper

Method of Evaluation:

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Bachelor of Design Curricula

Credit and Contact Period Distribution: B. DES (all pathways)

	Foundation			Year 2			Year 3			Year 4		
	Term I	**Term II**		**Term III**	**Term IV**		**Term V**	**Term VI**		**Term VII**	**Term VIII**	**Total**
Foundation Studio	I studio (12 credits)	I studio (12 credits)										
Major Studio				1 skills studio (12 credits)	1 skills studio (12 credits)		1 skills studio (12 credits)	1 skills studio (12 credits)			Thesis studio (18 credits)	
Minor Studio										I project studio (12 credits)		
Skills Workshop	2 course (8 credits)	2 course (8 credits)	Reserved Study Program (5 credits)						Elective National/ International Summer Project (10 credits)			
Major Seminar				3 courses (9 credits)	3 courses (9 credits)	Internship (10 credits)	3 courses (9 credits)	I course (3 credits)				
Minor Seminar										1 course (3 credits)		
Social Science Elective				1 course (3 credits)	1 course (3 credits)		1 course (3 credits)	1 course (3 credits)				
Research and Communication	1 course (2 credits)	1 course (2 credits)								1 course (3 credits)		
Humanities Elective					1 course (3 credits)			1 course (3 credits)			1 course (3 credits)	
Design Communication	1 course (1 credits for 5 weeks only)	1 course (1 credits for 5 weeks only)										
Management Elective				I course (3 credits)				1 course (3 credits)		1 course (3 credits)		
Total Credits	23	23	5	27	27	10	24	24	10	21	21	214
Contact Hours	345	330	75	405	405	150	360	360	150	315	315	3210

FNDS 001- Sound and Image Studio (6 Credits)

Class Outline

This studio is designed to explore concept and creation of works in sound and image using analog and digital means. The studio will introduce to students mixed media techniques in the virtual and real world. The studio will work towards the creation of original works in audio, video interactivity in many contexts.

Learning Objectives

1. To explore basic principles relations to the (re) production of sound and image.
2. To understand the basic methods of audio recording and (re)generation.
3. To understand basic methods of image (re)generation and photographic capture.
4. To understand interactivity between sound, image and context.
5. To learn to produce original design and artistic installations (both linear and interactive) using sound, image and context.

Learning Strategy:
Studio based collaborative learning

Contact Period (in hours):
90 Contact Periods

Form of Evaluation:
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 002 - Animation and Storyboarding Studio (6 Credits)

Class Outline

This studio is designed to introduce to students the art of giving life to objects through motion and storytelling. The course emphasizes foundational principles of motion, visual storytelling, non-linear forms of motion, interactive visualizing, and diverse approaches to motion graphics.

Learning Objectives

1. To understand the basic principles of Motion.
2. To understand the methods of linear and interactive Visual Storytelling.
3. To understand non-linear, and algorithmic motion.
4. To explore the diverse aesthetic approaches to motion graphics, traditional and digital.
5. The possibilities and relation of motion to time..

Learning Strategy:
Studio based collaborative learning

Contact Period (in hours):
90 Contact Periods

Form of Evaluation:
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 003 - Colour, and Texture Studio (6 Credits)

Class Outline:

This studio reviews the principles of visual design. Through projects it helps students explore basic principles of color and texture in the visual arts. The course shall emphasize familiarization with colors, textures, and planes.

Learning Objectives

1. To understand the generation and the language of 3 D form and space
2. To understand the experience of 3 D Form and space from a variety of perspectives
3. To understand the relationship between objects and the spaces they occupy and produce
4. The relationship of human body in & to space
5. The possibilities and limitations of materials to form

Learning Strategy:
Studio based collaborative learning

Contact Period (in hours):
90 Contact Periods

Form of Evaluation:
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 004 - Form and Space Studio (6 Credits)

Class Outline:
This studio is designed to introduce to students the basics of working with 3-dimensional form and space. The emphasis of the course is also on the production of 3-dimensional form using a variety of materials, hard, soft, and or ephemeral

Learning Objectives

1. To understand the generation and the language of 3 D form and space.
2. To understand the experience of 3 D Form and space from a manifold standpoints.
3. To understand the relationship between objects and the spaces they occupy and produce.
4. The relationship of human body in & to space.
5. The possibilities and limitations of materials to form.

Learning Strategy:
Studio based collaborative learning

Contact Period (in hours):
90 Contact Periods

Form of Evaluation:
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 001 - Basic Materials Skills Workshop I: Wood, Metal and Clay (4 Credits)

Class Outline:

This skills workshop is designed to familiarize students with basic working and skills of Clay, Metal and Wood. The Studio shall focus on working with these three materials starting from its rough, unprepared stage to a simple finished product.

Learning Objectives

1. Understanding the nature of Wood, Metal and Clay.
2. Preparatory process of Wood, Metal and, Clay
3. Introduction to hand and machine-operated tools for Clay, Metal and Wood
4. Impart knowledge of basic production process of Clay, Wood and Metal.

Learning Strategy:
Studio based collaborative learning

Contact Period (in hours):
60 Contact Periods

Form of Evaluation:
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks:

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 002 - Basic Materials Skills Workshop II: Textile and Fabric (4 Credits)

Class Outline

This skills workshop explores and introduces students the fundamental of fabrics and textiles, their production processes and the knowledge and understanding of functional and aesthetic requirements of textiles for a range of applications.

Learning Objectives

1. Knowledge and understanding of the contextual textile, clothing and allied industries.
2. Appreciation of significance of textiles in society
3. Practical skills in the production and manipulation of textile through use of appropriate means: weaving, knitting, printing, and embroidery.
4. Knowledge and Understanding of functional and aesthetic requirements of textiles for a range of applications.
5. Skills in experimentation, critical analysis and the discriminatory selection of textiles for specific end uses.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 003 – Basic Materials Skills Workshop: Introduction to Computer Graphic Skills (4 Credits)

Class Outline

This skills workshop explores and introduces students the fundamentals of computer software, their application to design. The aim of this workshop is to ensure students undergo a survey of various computer applications that are available, understand the ideological premise of the software, and how professionals use them, and their scope and limitations.

Learning Objectives

1. Knowledge and understanding of the contextual computer software, clothing and allied industries.
2. Basic skills in AutoCAD, Adobe Photoshop, Adobe InDesign etc
3. Practical skills in the application and manipulation of computer software for architectural practice
4. Knowledge and Understanding of functional and aesthetic requirements of architecture and the application of those in virtual environments.
5. Skills in experimentation, critical analysis and the discriminatory selection of computer software for specific end uses.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 004 – Basic Material Skills Workshop IV: Free Hand Drawing Skills (4 Credits)

Class Outline

This skills workshop is designed to explore and learn the fundamental of sketching and communicating ideas quickly and effectively. .

Learning Objectives

1. Demonstrate familiarity with basic drawing terms, tools, media and technique
2. Select frame and compose from relatiy to paper format
3. Recognise and manipulate negative / positive shapes and space with control variables
4. Perceive and utilize a full range of values for describing form, depth, structure while integrating these things into the forms surrounding space.
5. To understand line quality and its variations.
6. To understand Line quality and expressiveness.
7. Compose drawings
8. Use effective techniques to form objects and fragment them with environmental integration creating a sense of implies energy and motion .

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 005 - Basic Materials Skills Workshop V: Camera (4 Credits)

Class Outline

This skills workshop is designed to introduce the students to basic skills required to handle still and video camera. The overall aim is that the students not only familiarize themselves to the various technical aspects of the equipments abut also to instruct them on the concretization of the concepts through visual means.

Learning Objectives

1. To demystify the process of filming and photography.
2. To instruct students in camera dynamics, that is, uses of different components and their camera interplay.
3. To instruct students in the basic principle skills of photography and filming.
4. To instruct students in camera movement, composition and creative use of lighting.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours):
60 Contact Periods

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 006 - Basic Materials Skills Workshop VI: Sound (4 Credits)

Class Outline

This skills workshop is designed to introduce the students to basic characteristics of sound, basic and proficient equipments, the technique of recording, reproducing and mixing.

Learning Objectives

1. To train the students' ear for sound perception.
2. To familiarise the students with equipments of sound.
3. To train the students to be able to create sound perceptive.
4. To train the students to be able to create sound design for various media.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60 Contact Periods

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

RNCU 101–Freshman Writing Seminar (2 credits)

Class Outline

This course is designed to introduce the student to the methods and materials of academic writing. Through the use of reading journals, in-class writing exercises, homework, and essays, the course will explore a variety of ways to craft an essay, take notes on reading material, and respond critically to the material one reads.
This course has two components. The first is learning about the variety of essays one may write for academic and professional purposes. Examples of these are writing from experience, writing to compare, and writing about issues. The second is identifying themes common among the various essays we read.

Learning Objectives

1. The ability to read significant texts carefully and critically, recognizing and responding to argumentative positions.
2. The ability to write sustained, coherent and persuasive arguments on significant issues that arise from the content at hand.
3. The ability to write clearly, following the conventions of Standard English

Learning Strategy
Seminar based Enquiry

Contact Period
30

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

RNCU 102–Research Methods Seminar (2 credits)

Class Outline

This particular course is designed to function both as an introduction to questions of research and methodology as well as one which culminates in a seminar presentation of a particular topic. The course shall begin with an overview of what is research, why do research, what are the different kinds of research and then move on to specific exercises which will help you to answer questions like how do I find a topic, where do I find information on it, what do I do when I find it? Eventually one hopes that this course is able to bring us to a certain understanding of how one undertakes and brings to a successful fruition an academic research paper.

Learning Objectives

1. Understanding the questions of research
2. Introduction to different aspects of research such as, asking the right questions, framing the argument, listing sources, bibliography etc
3. Exposure to different sources of information and how to access them

Learning Strategy
Seminar based Enquiry

Contact Period
30

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARDR 101-Fundamentals of Drawing and Modelling- I(1 credit)

Class Outline

The objective of this course is to enable the student to learn the proper tools and techniques of producing the various types of drawing and models which they will make use of n their professional career. This will include orthographic projections, shade shadow, basic rendering techniques.

Learning Objectives

1. Introduction to simple 2 dimensional drawing elements, such as; line, point, plane
2. Introduction to orthographic projections- plans, section, and elevations.
3. Design of facades of simple and complex objects.
4. Basic shade and shadow of 2 Dimensional objects

Learning Strategy
Studio based collaborative learning

Contact Period
15 Contact Periods

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

ARDR 102 -Fundamentals of Drawing and Modelling- II (1 credit)

Class Outline

The objective of this course is to enable the student to learn the proper tools and techniques of producing the various types of drawing and models which they will make use of in their professional career. This will include isometric and perspectives projections, shade shadow, basic rendering techniques.

Learning Objectives

1. Introduction to simple 3 dimensional drawing elements, such as; form, volume and space
2. Introduction to isometric projections from plans, section, and elevations.
3. 2 and 3 point perspective.
4. 3 dimensional modelling

Learning Strategy
Studio based collaborative learning

Contact Period
15 Contact Periods

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Communication Design Pathway

CDDS 201: Communication Design Studio - Introduction to Graphic Design (12 Credits)

Class Outline

This course combines studio work with classroom instruction. Fundamental components of design theory and typography are incorporated with problem definition to provide students with valuable experience in the ideation, research, execution and presentation of projects. Lectures and visual media provide a broad introduction to the visual communication professional field.

Learning Objectives

1. To gain exposure to the basic components of graphic design
2. To familiarize the students with the idea of visual communication
3. To begin to communicate basic design ideas through visual media

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDCC 201: Communication Design Major Seminar - Creative Copywriting (3 Credits)

Class Outline

This course surveys the written expression and economy of words and thought associated with advertising and creative thinking. Students experience and learn the rudimentary techniques of writing persuasive advertising.

Learning Objectives

1. Exposure to basic editorial/journalistic writing
2. To familiarize students with the role of copy/text in communication design
3. Learn to express oneself through words

Learning Strategy

Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)

45

Form of Evaluation

Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDTY 201: Communication Design Major Seminar – Typography (3 Credits)

Class Outline

Through lectures, demonstrations and studio work, students are introduced to all aspects of typography, from its historical precedents to its current use. Creative thinking is encouraged, along with prescribed techniques and media.

Learning Objectives

1. To familiarize the students with different Typesets
2. To understand the basic components of Typography such as Serif, Sans Serif etc
3. To be exposed to the historical evolution of typography
4. To understand different modes of type-printing such as typewriters, block printing etc

Learning Strategy

Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)

45

Form of Evaluation

Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDHG 201: Communication Design Major Seminar - History of Graphic Design (3 Credits)

Class Outline

This course surveys the pivotal events and achievements that led to the current state of graphic communication. The unceasing quest to give form to ideas is traced from the pictographs painted on cave walls to the latest imaginative designs. Through lectures, videotapes, discussions, presentations and research, students are introduced to the creative thinkers, important innovations and breakthrough technologies that have shaped the evolution of visual communication.

Learning Objectives

1. To gain a basic idea of the historical evolution of graphic design
2. To understand the role of visual communication in history
3. To realize the impact of images and their ability to record and influence history
4. Introduce students to the debate of how visuals have influenced the writing of history

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDDS 202: Communication Design Studio - Introduction to Advertising (12 Credits)

Class Outline

In this primary course, students are given an overview of the advertising industry. Through lectures, readings, and hands-on assignments, students are introduced to the roles of advertisers, advertising agencies and creative professionals. Topics include the influential pioneers and their work from the late twentieth century to contemporary times, case studies of important campaigns, and the evolution of creative advertising. Class projects and guided studio work provide students with hands-on experience creating advertisements using the same tools and techniques that creative professionals work within the advertising industry today.

Learning Objectives

1. Understanding the role of advertising as a form of visual communication
2. To familiarize the students with the tools of the advertising trade
3. Looking at the role of advertising in shaping popular opinion
4. To begin designing basic ad campaigns for everyday objects

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDAP 202: Communication Design Major Seminar - Advertising Perspectives and Profiles (3 Credits)

Class Outline

This course surveys the evolution and achievements of advertising through the investigation of advertising trends, past and present. Lectures, visual presentations, discussions and research promote students' exploration of the leaders, agencies, events and campaigns that have influenced advertising, contributed to advertising innovations, and suggested directions in which advertising may be headed.

Learning Objectives

1. To investigate the journey of advertising thus far
2. To study influential ad campaigns in the past that have influenced the direction of the discipline
3. To look at how visual communication follows certain trends

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDUC 202: Communication Design Major Seminar - Understanding Client Objectives (3 Credits)

Class Outline

Advertising, as an extension of marketing, needs to be understood in context with all aspects of marketing. This course starts with the introduction of the four Ps: product, price, place and promotion, and then transitions into a deeper investigation of the latter of these principles. Presenting the rudiments of advertising and marketing in a way that is sensible and logical to the art director and copywriter, the course explains how the message, the target market and subsequent positioning impacts the overall advertising effort. Projects are used as primary tools for defining the principles.

Learning Objectives

1. To look at visual communication as a client-centric practice
2. Learn to appropriately place oneself and the product in the market
3. To familiarize the students with "selling strategies"
4. Understand basic terms such as target-market, focus-group, message, deliverables etc

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDDP 202: Communication Design Major Seminar - Digital Production Skills for Advertising Designers (3 Credits)

Class Outline

Digital design software applications are the essential tools of the advertising designer today. Through lectures, demonstrations and guided classroom exercises, students explore the capabilities and uses of a range of digital design tools. Upon successful completion of this course, students have a working knowledge of the essential software applications, and are prepared to use them to produce projects in subsequent courses.

Learning Objectives

1. Familiarise the students with digital platforms for the production of visuals
2. Help students realize the potential of digital tools in contemporary advertising
3. To explore the possibilities of web-based advertising
4. Understand basic software tools

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDDS 301: Communication Design Studio - Drawing and Design for Illustrators (12 Credits)

Class Outline

The aim of this course is to understand how drawing can lead to strong and effective illustration. Drawing and design skills are extended by placing the emphasis on communication. Assignments, lectures and demonstrations explore commonly employed illustrative components such as observation, perspective, light and shadow, construction of form, composition, and the interpretation of the subject as well as the style of drawing. The use of photo reference is considered, and students will be introduced to the professional process of creating thumbnail sketches, roughs and finished sketches.

Learning Objectives

1. To understand the role of freehand drawing in the production of visuals
2. To familiarize the students with basic drawing techniques such as perspective, shadow, composition etc
3. Begin basic storyboarding through thumbnail sketches etc.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDSI 301: Communication Design Major Seminar - Survey of Illustration (3 Credits)

Class Outline

Students focus on illustration and its historical relationship to both fine arts and commercial applications. Illustration is directly linked to ever-changing social and political trends, fine art movements and technological advances in the field of publishing. Through the use of videos, slides, book references and lectures, students explore a variety of images and concepts regarding past and present illustration markets.

Learning Objectives

1. Familiarize the students with the larger art movements in history
2. To help students understand the commercial applications of illustration
3. To introduce the students to the publishing industry as a market for illustrators

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDEI 301: Communication Design Major Seminar - Editorial Illustration (3 Credits)

Class Outline

This course addresses concepts in illustration and seeks to expand students' capability to solve visual problems with creative, individual and expressive imagery. Assignments provide the context for this exploration and challenge students to enter new territory in their search for unique and provocative ideas. Editorial illustration embraces strong conceptual approaches to picture making and is fertile ground for creativity and expression.

Learning Objectives

1. To understand illustration as a tool of critique
2. To look at imagery as a provocateur

Learning Strategy

Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)

45

Form of Evaluation

Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDAC 301: Communication Design Major Seminar - The Art of Caricature Contact (3 Credits)

Class Outline

The artist's perspective in social, political and satirical commentary is examined in this studio course. The history of caricature, from Francisco Goya and Honoré Daumier through David Levine and Al Hirschfeld, is incorporated into lectures and assignments.

Learning Objectives

1. To understand caricature as a valid tool of critique
2. To look at the history of caricature
3. To familiarize oneself with contemporary political satire
4. To look at caricature as a reflection on one's own life

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDDS 302: Communication Design Studio - Communication Design for Alternative Media (12 Credits)

Class Outline

This course explores advertising design opportunities beyond traditional media. Students conduct a thorough analysis of the application of alternative media opportunities resulting from changes in demographic and cultural tendencies, environmental development and technological advances.

Learning Objectives

1. To understand the various forms of traditional and non-traditional media
2. To look at the impact of culture and demographics on communications
3. To investigate how technological advances change the media of communication
4. To familiarize students with the idea of responsible communication

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDCI 302: Communication Design Major Seminar -Design and Technology: Contemporary Issues in Visual Communication (3 Credits)

Class Outline

This course explores the technological, theoretical, cultural, social, political and economical issues currently affecting the field of graphic design. Students analyze the current state of the field of graphic design as a means of visual communication to employ effective design solutions for issues and topics relevant to contemporary design culture.

Learning Objectives

1. To look at the theoretical, cultural, social, political and economical issues that influence Communication Design
2. To investigate contemporary issues that affect the field of graphic design
3. To understand visual communication as a means to address socio-political issues in society

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDSI 302: Communication Design Major Seminar - Design for Social Issues (3 Credits)

Class Outline:

This course addresses the designer's role in shaping the public narrative on social issues, causes and other needs-based topics. Students examine contemporary cultural, political and societal issues around the world that have an impact on our daily lives. They also learn how to design communication strategies that increase awareness, motivate, inspire or incite action from specific or broad audiences.

Learning Objectives

1. Understand the impact of visual communication in our lives
2. Make the students aware of how visual communication can be an effective mechanism for addressing social issues
3. Examine the relationship that society and visual communication have

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDIA 302: Communication Design Major Seminar - Interactive and Digital Media in Advertising (3 Credits)

Class Outline

In this course students will build on previous knowledge of current multi-platform applications of advertising and explore the possibilities of emerging technologies and their media applications. Students will enhance their digital production skills and hone the craft of art directing an integrated multi-platform campaign.

Learning Objectives

1. Examine the role of digital media in advertising
2. Understand the contemporary scenario of new media and multi-platform advertising
3. Discuss new emergent technologies and their impact on advertising
4. Be exposed to co-ordinated multi-platform campaigns that form the contemporary ad-world

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMI 401: Design Minor Studio (12 Credits): Any IDST -, CDST -, HDST -, DIST -, DMST - , ARDS -

Class Outline

In this course students are asked to take any one design studio from any other design discipline (including Architecture and Mass Communication) on offer. During the semester, the students will also take the support studio/seminars associated with the chosen studio.

Learning Objectives

1. The learning objectives of the chosen studio apply.

Learning Strategy

Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)

180 Contact Periods

Form of Evaluation

Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMC 401: Design Minor Seminar (3 Credits)
Any IDMA-, HDMA -, DIMA -, DMMA -, CDMA -, ARMS -

Class Outline

During the semester, the students will take the support studio/seminars associated with the chosen design studio.

Learning Objectives

1. The learning objectives of the chosen seminar apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

CDDS 402: Communication Design Thesis Studio (12 Credits)

Class Outline

Senior Thesis studio asks students to identify a problem that can be solved through design, create prototypes, experiment with form, and arrive at a final proposed solution. The first half of the semester primarily focuses on research, articulation, and experimentation. Students will be expected to develop their ideas both in written and visual forms, and clearly present their central ideas, research, methodology and project production in process. Seniors are strongly encouraged to consult academic advisors, fellow students, and the instructors before choosing a section. The second half of the semester begins with prototyping the ideas articulated earlier, moves through solving in-depth issues concerning production and refinement, and ends with a finished, exhibition-quality project.

Learning Objectives

1. To focus on an end-to-end solution for visual communication
2. Learn how to fashion a finished product for market-consumption
3. Provide a holistic overview of the entire visual communication experience
4. Become adept at all facets of visual communication

Learning Strategy

Studio based collaborative learning

Contact Period (in hours)

180

Form of Evaluation

Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Digital & Interactive Design Pathway

DIDS 201: Digital & Interactive Design Studio - Introduction to Interactive Design (12 Credits)

Class Outline

Through individual and group exercises, students are introduced to critical aspects of interactive art and design from physical computing to installation art to traditional and nontraditional websites. A history of the interactive medium is presented, and the breadth of the medium is critically introduced, discussed and explored. Through in-class exercises, students practice composition, aesthetics, and various types of interactive art. Key individuals, media, software tools and associations also are explored.

Learning Objectives

1. Introduction to basic interactive art
2. Familiarisation with the wide range of interactive platforms from websites to installations
3. Look at the critical role computing plays in our lives today

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIDA 201: Digital & Interactive Design Major Seminar - Digital Design Aesthetics (3 Credits)

Class Outline

This course provides the foundation for visualizing and understanding the essential vocabularies, principles and concepts of design, color and visual literacy as applied to interactive digital work.

Learning Objectives

1. Introduce the students to basic theories of aesthetics
2. Develop an understanding of a vocabulary of design
3. Understand the meaning of visual literacy
4. Introduction to basic colour theory

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIDY 201: Digital & Interactive Design Major Seminar - Information Design for Dynamic Media (3 Credits)

Class Outline

This course addresses the fields of information visualization and user interface design and their intersection in the field of interactive design. Through the exploration of key principles and methodologies of these fields, students will develop a working knowledge of the means by which dynamic media systems—websites, games, information aggregators, Smartphone applications, etc.—organize, visualize, and present information to the end users of screen-based media. Students learn and use industry methodologies to develop information-intensive interactive projects through a series of progressive assignments.

Learning Objectives

1. Develop a working knowledge of interface design
2. Understand the potential of dynamic media systems
3. Introduce the basics of game theory

Learning Strategy

Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)

45

Form of Evaluation

Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIIE 201: Digital & Interactive Design Major Seminar - Survey of Interactive Entertainment (3 Credits)

Class Outline

This course chronicles the history and evolution of interactive and game design while reflecting on its immediacy through Internet and game culture trends. Students examine the social and artistic influences in computer mediated communications and game theory principles.

Learning Objectives

1. Understand past and present gaming, and how the industry has changed
2. Look at the history of mass media, and the emergence of interactive entertainment
3. Discuss the artistic influences in computer related communications

Learning Strategy

Seminar based Enquiry

Contact Period (in hours)

45

Form of Evaluation

Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIDS 202: Digital & Interactive Design Studio - Fundamentals of Game Design (12 Credits)

Class Outline

This course introduces students to game design through analysis, application and discussion of the game space, game mechanics, the game player, and the design decisions that create the game state. Through in-class game play and game design exercises, students will explore the design process through the concepts of player agency and immersion, while structures of goals—both short-term and long-term— force consideration of challenge, conflict and reward. Ultimately, students assess the needs of a target audience and create a game space and a game expressly designed for that audience while providing critical feedback to their peers on their own designs.

Learning Objectives

1. Develop an advanced understanding of game theory principles
2. Analyse the structure of various interactive games, structure of goals, challenge, conflict etc.
3. Create a basic game space with an understanding of game theory

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIML 202: Digital & Interactive Design Major Seminar - Modeling, Materials and Lighting (3 Credits)

Class Outline

Modeling techniques and aesthetic skills required to create, texture and light 3-D objects are explored. Through the use of industry standard 3-D software, students will learn methods and procedures to create 3-D models efficiently and accurately. They will also learn to create textures, shaders and materials for 3-D geometry. Students will create visualizations in 3-D through real-world observations.

Learning Objectives

1. Begin basic modeling of virtual worlds
2. Understand how to create textures, shaders and materials in an interactive environments
3. Co-relations between real world and virtual world gaming

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIAI 202: Digital & Interactive Design Major Seminar - Introduction to Robotics AI (3 Credits)

Class Outline

This course introduces students to the field of experience design relating to robotics and the code that controls them. Concepts of interactive design and game design relating to robotics will be learned and applied using object-oriented programming and artificial intelligence. Students investigate the recent history of robotics as well as the essential concerns and methodologies of the field. Students will create a series of robotic projects in order to understand the basic principles of robotics, artificial intelligence and object-oriented programming.

Learning Objectives

1. Introduce the students to the basics of Artificial Intelligence
2. Be familiar with the concerns and methodologies of robotics
3. Investigate how interactive design and robotics come together
4. Develop basic code and control routines

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIIN 202: Digital & Interactive Design Major Seminar - Programming for Interactivity (3 Credits)

Class Outline

This course introduces object-oriented programming techniques using a scripting language. This class builds upon the Interactive Design course, enabling students to develop projects that include complex interactive websites, experimental interactive work and online games.

Learning Objectives

1. Develop a basic understanding of scripting language
2. Familiarise the students with experimental interactive work
3. Analyse & develop basic browser-based online games

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIDS 301: Digital & Interactive Design Studio - Action Analysis I (12 Credits)

Class Outline

Drawing from life is at the foundation of understanding human and animal articulation, proportion, balance, weight and pose essential for the animator. By using observational drawing techniques to learn to see, students explore issues of human and animal pose and motion relevant to animation.

Learning Objectives

1. Understand animation as a representational tool
2. Study and analyse basic animal pose and motion
3. Have a basic familiarity with concepts such as balance, weight and pose
4. Understand how motion can be captured in images

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIHA 301: Digital & Interactive Design Major Seminar - History of Animation (3 Credits)

Class Outline

This course focuses on the history and aesthetics of animation, with references to related arts such as live-action cinema, puppetry and comics. Screenings include a wide range of commercial and experimental works produced throughout the world. Students create small projects and written works pertaining to course topics.

Learning Objectives

1. Familiarise the students with the development of animation through time
2. Analyse related arts such as puppetry, comics and action cinema to relate them to animation
3. Develop and understanding of the aesthetics of animation

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DISD 301: Digital & Interactive Design Major Seminar - Principles of Screen Design (3 Credits)

Class Outline

Screen design is fundamental to animation communication. In this course, students expand upon traditional media skills and animation craft by adding the element of screen design. Through individual approach and expression in traditional and digital media, students communicate by juxtaposing and sequencing imagery to develop a sense of artist-audience construct and consequence.

Learning Objectives

1. Apply traditional media skills and animation to screen design
2. Understand imagery sequence
3. To analyse animation as a tool for communication

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIFS 301: Digital & Interactive Design Major Seminar - Digital Form, Space and Lighting (3 Credits)

Class Outline

Topics covered throughout this course include the theories of 3-D space, object modeling, procedures for texture mapping, lighting and rendering. Students learn how to construct basic digital 3-D models of character and environment.

Learning Objectives

1. Learn techniques of digital mapping, rendering and lighting
2. Make basic 3-D models of simple environments
3. Preliminary skills of object modeling and shape construction

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIDS302: Digital & Interactive Design Studio - Action Analysis II (12 Credits)

Class Outline

Providing valuable observational skills for both a 2-D and 3-D student, this course furthers students' knowledge of human and animal articulation and movement, combining observational studies with animation exercises. In addition to drawing, students learn how to utilize live action footage to breakdown and recreate the essence of human and animal motion.

Learning Objectives

1. To use live action footage to analyse movement
2. To begin to work with human movement and articulation to create realistic animation

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIMM 302: Digital & Interactive Design Major Seminar - Reality-based Motion Media Design (3 Credits)

Class Outline

This course develops an understanding of the documentary format as it relates to contemporary broadcast contexts. Through a process of critical viewing and analysis of the documentary form, along with practical assignments, students are expected to explore and develop models of documentary that work in the broadcast world. In addition, students are expected to develop a thorough understanding of the history, techniques and issues related to the documentary form.

Learning Objectives

1. Develop an understanding of the humanities and how they influence reality-based motion media
2. Study and critically analyse the contemporary documentary form
3. Understand the role played by motion media in documentary form

Learning Strategy

Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)

45

Form of Evaluation

Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIUC 302: Digital & Interactive Design Major Seminar - User-centered Design for Dynamic Media (3 Credits)

Class Outline

This course focuses on the principles and methodologies used throughout the interactive design industry for creating screen-based dynamic media—websites, information installations, Smartphone applications, etc. Specifically, students address the interactive design process used to create dynamic media and endogenous meaning systems.

Learning Objectives

1. Understand the potential and limitations of screen-based dynamic media
2. Create simple smartphone apps
3. Analyse the creation of user-centered design as a tool of communication

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DICG 302: Digital & Interactive Design Major Seminar - Cognitive Art of Game Design (3 Credits)

Class Outline

This course pushes students from the game space and the game player into practical, theoretical, controversial and abstract principles and applications within the cognitive art of game design. Through regular in-class prototype and play sessions as well as four longer-term game design projects, students consider, question and add a wide range of concepts to their already existing game design skills. Students explore the concept of a game as a generator of attachment, emotion and controversy, and hone their skills through a study of balance, semiotics, theme, narrative and interaction.

Learning Objectives

1. Advance understanding of Game Theory
2. Explore the concept of a game as a generator of attachment, emotion and controversy
3. Hone their skills through a study of balance, semiotics, theme, narrative and interaction

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMI 401: Design Minor Studio (12 Credits):
Any IDST -, CDST -, HDST -, DIST -, DMST - , ARDS -

Class Outline

In this course students are asked to take any one design studio from any other design discipline (including Architecture and Mass Communication) on offer. During the semester, the students will also take the support studio/seminars associated with the chosen studio.

Learning Objectives

1. The learning objectives of the chosen studio apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMC 401: Design Minor Seminar (3 Credits)
Any IDMA-, HDMA -, DIMA -, DMMA -, CDMA -, ARMS -

Class Outline

During the semester, the students will take the support studio/seminars associated with the chosen design studio.

Learning Objectives

1. The learning objectives of the chosen seminar apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DIDS 402: Digital & Interactive Design Thesis Studio (12 Credits)

Class Outline

Students in interactive design and game development develop an innovative and theoretically informed body of work that is exhibited in a manner and context that supports its creative content.
This course enables students to analyze and develop interactive projects with physical input devices. Students develop simple interactive prototypes using switches, sensors and computer vision interfaces. Alongside the practical coursework, students read, analyze and discuss the origins and evolution of interactive art, interaction design and alternative gaming through relevant texts and projects. In the second part of the class, they research appropriate hardware and software solutions and develop independently a personal project. Students also produce short video documentation of each one of their projects.

Learning Objectives

1. The thesis aims at developing a framework to support the automated synthesis of dependable image processing sub-systems.
2. During this thesis students will put into practice their understanding of interactive design and gain skill on high level synthesis tools
3. Be able to handle a live project in their individual capacities

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Fashion Design Pathway

FDDS 201: Fashion Design Studio - Introduction to Fashion Design & Fashion Technology (12 Credits)

Class Outline

This course addresses the basics elements of the fashion design process, from concept through 2-D development towards a final 3-D realization. Assignments introduce the design processes of trend and inspiration research, storyboarding compiling, color story, fashion sketching, flats and design innovation.
Students are also introduced to professional standard sewing techniques and apparel construction. Through assignments, the techniques are applied to produce finished garments.

Learning Objectives

1. Basic story boarding and colour mapping
2. Rudimentary figure sketching
3. Introduction to standard sewing techniques and apparel construction
4. Training in trend and inspiration research

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDIT 201: Fashion Design Major Seminar - Introduction to Textiles (3 Credits)

Class Outline

This lecture course introduces students to the qualities and properties of fashion fabrics. By investigating the fibers, quality, construction, care and finishing of textiles, students will learn the basics of fabric identification and specific uses in the fashion industry.

Learning Objectives

1. Basic identification of different textiles
2. Understanding of basic processes in textile production
3. Be well versed with terms such as fibers, construction of textiles, fabric care etc
4. Be aware of different uses of different fabrics

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDDE 201: Fashion Design Major Seminar - Decorative Surfaces (3 Credits)

Class Outline

In this study of fabrics, students manipulate fabrics and textures to produce special decorative effects for detailing fashion apparel at all levels of the marketplace.

Learning Objectives

1. Identify different kinds of traditional decorative design practices
2. Be exposed to detailing of finished fabric

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDFT 201: Fashion Design Major Seminar - Fashion Theory (3 Credits)

Class Outline

This course is an advanced study of the mechanisms that promote fashion change. Topics include color, textile and style forecasting. The course promotes discussion of fashion as a psychological and sociological phenomenon of temporary style preferences. Through methods of consumer research and sales forecasting, students identify and analyze the connection between consumer preferences and product.

Learning Objectives

1. Basic understanding of Colour Theory
2. Looking at fashion as a sociological phenomenon
3. Understanding interpreting consumer research, sales forecasting etc
4. Preliminary analysis of fashion and style forecasting

Learning Strategy

Seminar based Enquiry

Contact Period (in hours)

45

Form of Evaluation

Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDDS 202: Fashion Design Studio - Apparel Development I (12 Credits)

Class Outline

This studio course explores the development of basic level apparel styles through the application of the draping principles on the three-dimensional dress form. Students study the process from initial design concept through first sample.

Learning Objectives

1. Basic design and sampling of a garment
2. Basic fabric selection and garment styling
3. Understand bodyscaping and draping

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDFS 202: Fashion Design Major Seminar - Introduction to Fashion Sketching (3 Credits)

Class Outline

This course introduces a fashion drawing technique to communicate the ideas, moods and details of garments by visually interpreting fashion apparel, including the body proportions used in basic fashion drawing. Drawing techniques integrate the use of croquis and the concept of flat specification. As students create various croquis bodies for individual portfolios, they are expected to develop their own personal style and flat pattern drawing skills.

Learning Objectives

1. Intermediate understanding of free-hand sketching, body proportions and human figures
2. Development of fashion concepts and personal styles
3. Making mood-boards and color palettes

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDHF 202: Fashion Design Major Seminar - History of Fashion (3 Credits)

Class Outline

This course presents a visual history of fashion from ancient Egypt to the present, with particular emphasis on recent history from the mid-19th through the early 21st centuries. Students discuss and analyze historical periods and their influence on contemporary fashion.

Learning Objectives

1. Introduction to early fashion and it's applications in the contemporary world
2. Development of contemporary fashion through the 20th century
3. Analyzing the influence culture and society on fashion and style through time

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDCT 202: Fashion Design Major Seminar - Current Trends and Forecasting (3 Credits)

Class Outline

This course focuses on current fashion trends in the international market. Through group discussion and analysis of current videos and published fashion materials, students produce reports on their own observations of the trends and how these trends relate to personal design developments.

Learning Objectives

1. Predicting future trends of fashion through analysis of historical trends
2. Analysing fashion literature
3. Understanding trends and fashions as a product of society and culture

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDDS 301: Fashion Design Studio- Apparel Development II (12 Credits)

Class Outline

This studio course explores the development of intermediate level apparel styles through the application of pattern drafting principles. Students draft and execute professional standard patterns through flat pattern methods, measurements, and rub-off. Students study the process from initial design concept through first sample.

Learning Objectives

1. Advanced understanding of garment styling
2. Comprehensive understanding of the production process
3. Drafting of human figures and patterns

Learning Strategy

Studio based collaborative learning

Contact Period (in hours)

180

Form of Evaluation

Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDFI 301: Fashion Design Major Seminar - Fashion Illustration (3 Credits)

Class Outline

This course explores many aspects of fashion illustration from drawing basic fashion figures to producing finished professional illustrations in color. The course addresses fashion illustration from the perspectives of both fashion designers and fashion illustrators and examines the role of fashion illustration in different areas of the fashion industry.

Learning Objectives

1. Looking at fashion illustration as a unique and independent discipline
2. Understanding how fashion illustration can contribute to the dissemination of fashion
3. Producing finished professional illustrations in color

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDCP 301: Fashion Design Major Seminar - Computer-aided Fashion Design & CAD Patternmaking (3 Credits)

Class Outline

This course provides the opportunity for students to integrate their fashion design development with computer-aided systems. The emphasis is on fashion innovation and concept design exploration enhanced by computer applications.
Performing a variety of functions in the organization, storage and retrieval of patterns within a CAD system, students in this course will be introduced to and develop skills for the application of current CAD/ CAM technologies for apparel production, including computer-aided design for apparel patternmaking, pattern alterations, and made-to-measure patterns.

Learning Objectives

1. Learn to integrate their fashion design development with computer-aided systems
2. Use storage and retrieval of patterns within a CAD system
3. Use CAD/ CAM technologies for apparel production, including computer-aided design for apparel patternmaking, pattern alterations, and made-to-measure patterns

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDBF 301: Fashion Design Major Seminar - The Business of Fashion (3 Credits)

Class Outline

This course is directed toward the commercial and professional elements of fashion. Students are expected to analyze all aspects of merchandising and marketing within fashion and its related industries.

Learning Objectives

1. Be exposed to area of merchandising and marketing in fashion
2. Understand the fashion market and trends
3. Learn about the commercial and professional elements of fashion

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45
Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDDS 302: Fashion Design Studio - Apparel Development III (12 Credits)

Class Outline

This studio course explores the development of advanced apparel styles through the application of pattern drafting and draping principles. This course exposes the student to the design process from initial concept, muslin sample development and final execution of finished garments.

Learning Objectives

1. Detailed, advanced understanding of the garment finishing process
2. In-depth know-how of the entire apparel design and manufacturing process
3. First-hand experience of the final execution of finished garments

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDKD 302: Fashion Design Major Seminar - Knitwear Design for Fashion (3 Credits)

Class Outline
Students are introduced to the processes of creating fully-fashioned knitwear. Assigned projects support the development of a knitwear sample book, and students explore various techniques and processes needed to create finished apparel.

Learning Objectives

1. Understanding the processes of creating fully-fashioned knitwear
2. Making a knitwear sample book
3. Exploring various techniques and processes needed to create finished apparel

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDMD 302: Fashion Design Major Seminar - Menswear Design (3 Credits)

Class Outline

This studio course explores the fashion menswear market. Focus is on trend identification, silhouette and style, portfolio presentation of trend boards and design developments. This course is for students who are interested in the concept of innovative design. Students will acquire a clear understanding and the necessary experience of generating, developing and realizing a wide variety of creative menswear ideas.

Learning Objectives

1. Exploring trends in the fashion menswear market
2. Stressing on the concept of innovative design
3. Developing and realizing a wide variety of creative menswear ideas

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDCD 302: Fashion Design Major Seminar - Childrenswear Design (3 Credits)

Class Outline

This course addresses the unique considerations in designing and manufacturing childrenswear, including identification of childrenswear construction, pattern components and apparel sizing. Students develop pattern blocks from which advanced childrenswear designs will be executed.

Learning Objectives

1. Understanding the unique considerations in designing and manufacturing childrenswear
2. Identification of childrenswear construction, pattern components and apparel sizing
3. Developing advanced childrenswear designs

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMI 401: Design Minor Studio (12 Credits):
Any IDST -, CDST -, HDST -, DIST -, DMST - , ARDS -

Class Outline

In this course students are asked to take any one design studio from any other design discipline (including Architecture and Mass Communication) on offer. During the semester, the students will also take the support studio/seminars associated with the chosen studio.

Learning Objectives

1. The learning objectives of the chosen studio apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180 Contact Periods

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMC 401: Design Minor Seminar (3 Credits)
Any IDMA-, HDMA -, DIMA -, DMMA -, CDMA -, ARMS -

Class Outline
During the semester, the students will take the support studio/seminars associated with the chosen design studio.

Learning Objectives
1. The learning objectives of the chosen seminar apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FDDS 402: Fashion Design Thesis Studio (3 Credits)

Class Outline

Students develop three-collection concepts, one of which is selected for completion and presented to a jury of industry professionals. In conjunction with the thesis project, students develop a portfolio and participate in several high-level competitions.
The student focuses on conceptualizing an original 2-D collection specializing in a major area of design. Students explore identifying customer profiles, researching major areas of specialization, sources of inspiration, and fabrication selection. The student will develop portfolio-ready technical sketches, illustrations, flats, storyboards, color storyboards and fabric swatches.
The emphasis is on the production of the first sample muslin or prototype through the application of advanced draping and pattern drafting techniques. Students work with fit models to learn the various fitting procedures used in the industry. Pattern alterations and manipulations are demonstrated in class to show how alterations are processed and corrected on the paper pattern. Presentation of final muslins is critiqued prior to the development of final garments.

Learning Objectives

1. Identifying customer profiles, researching major areas of specialization
2. Looking for of inspiration, and fabrication selection
3. Making portfolio-ready technical sketches, illustrations, flats, storyboards, color storyboards and fabric swatches
4. Pattern alterations and manipulations, how alterations are processed and corrected on the paper pattern

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Habitat Design Pathway

HDDS 201: Habitat Design Studio - Form, Space and Order (12 Credits)

Class Outline

This course cultivates the ability to develop creative abstract design thinking and translate it into the three-dimensional composition of space and form with a system of formal architectural ordering. The course cultivates design process tools such as diagramming, drawing, and model making through a series of design explorations including abstract ideation, physical embodiment, architectural composition, and precedent analysis exercises.

Learning Objectives

1. Develop creative abstract design thinking and translate it into the three-dimensional composition of space and form
2. Cultivate design process tools such as diagramming, drawing, and model making
3. Explore abstract ideation, physical embodiment, architectural composition, and precedent analysis exercises

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDAD 201: Habitat Design Major Seminar - Analytical Design Sketching (3 Credits)

Class Outline

This course focuses on creative conceptual thinking and investigative rapid visual analysis. The students in this course will investigate a variety of design objects from architecture to furniture through combination of conceptual analysis, diagramming, and sketching.

Learning Objectives

1. Develop creative conceptual thinking and investigative rapid visual analysis
2. Investigate a variety of design objects from architecture to furniture
3. Learn conceptual analysis, diagramming, and sketching

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDMT 201: Habitat Design Major Seminar - Materials and Techniques (3 Credits)

Class Outline

This course focuses on the integration of design and fabrication skills necessary to complete an original project. The course covers the properties and working characteristics of hand tool use, joinery techniques and safe machine operations in the use of materials appropriate to habitat design.
In this course, students synthesize their design and fabrication skills. The course explores the conceptual, aesthetic, and structural issues involved with the design and construction of a project utilizing a range of techniques and commonly used materials.

Learning Objectives

1. Integration of design and fabrication skills
2. Familiarize the students with properties and working characteristics of hand tool use, joinery techniques and safe machine operations
3. Help students synthesize their design and fabrication skills

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDEV 201: Habitat Design Major Seminar - Electronic Design and Visualization (3 Credits)

Class Outline

This course is an opportunity to gain essential skills for design communication through 2-D drawing and 3-D modeling. Students will produce presentation documents and presentations that clearly communicate the formal and technical aspects of a design form. The course will focus on a fluid process of digital modeling and technical drawing.

Learning Objectives

1. Gain essential skills for design communication through 2-D drawing and 3-D modeling
2. Produce presentation documents and presentations that clearly communicate the formal and technical aspects of a design form.
3. Understand the fluid process of digital modeling and technical drawing

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDDS 202: Habitat Design Studio - Interior Design Studio (12 Credits)

Class Outline

This studio course conducts the study of interior design through research, analysis, programming, conceptualization and design of the interior environment. Projects include exercises in spatial organization, anthropometrics and circulation on an increasingly complex scale. Emphasis is placed on design for populations with special needs, such as children, the elderly, the disabled and the economically disadvantaged. Mandatory portfolio review and assessment occur at the conclusion of this course.

Learning Objectives

1. Study interior design through research, analysis, programming, conceptualization and design of the interior environment.
2. Understand terms such as spatial organization, anthropometrics and circulation
3. Design for populations with special needs, such as children, the elderly, the disabled and the economically disadvantaged

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDIM 202: Habitat Design Major Seminar - Interior Materials (3 Credits)

Class Outline

This course presents a broad study of interior finishes and furnishings. The specification, composition, construction and application/usability of finishes and furnishings are covered. Lectures, demonstrations, projects and field trips promote the development of design ideas related to materials as well as sustainable materials and finishes.

Learning Objectives

1. Study the specification, composition, construction and application/usability of finishes and furnishings
2. Promote the development of design ideas related to materials as well as sustainable materials and finishes
3. Complete a broad study of interior finishes and furnishings

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDHI 202: Habitat Design Major Seminar - History of Interior Design (3 Credits)

Class Outline

This course offers a comprehensive and concise compendium of the history of interiors from antiquity to present with reference to interiors as a social art, responsive to historical and cultural influences. Design theories and philosophies are explored in reference to their influence on interiors along with the complexity and intricacies of the sensory relationship of humans with interior space over time.

Learning Objectives

1. Understand interiors as a social art, responsive to historical and cultural influences
2. Explore design theories and philosophies in reference to their influence on interiors
3. Understand the complexity and intricacies of the sensory relationship of humans with interior space

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDLI 202: Habitat Design Major Seminar - Lighting for the Interior (3 Credits)

Class Outline

This course explores the use of lighting as a design element in the interior environment. Basics of electricity and electrical distribution systems, function, use and control of light, lighting fixtures and lighting installation are topics for lecture and discussion. Through demonstrations in the lighting lab, luminaries and lamps are compared with regard to glare, light distribution, intensity, color, color rendition, energy effectiveness and cost.

Learning Objectives

1. Basics of electricity and electrical distribution systems, function, use and control of light, lighting fixtures and lighting installation
2. Compare luminaries and lamps with regard to glare, light distribution, intensity, color, color rendition, energy effectiveness and cost
3. Explore the use of lighting as a design element in the interior environment

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDDS 301: Habitat Design Studio - Introduction to Furniture (12 Credits)

Class Outline:

This course introduces students to the field of furniture design. Through lectures, class discussions and exercises, students develop and apply creative problem-solving skills as well as formulate, communicate, and present a sound basis for their ideas.

Learning Objectives

1. Develop and apply creative problem-solving skills to furniture design
2. Learn to formulate, communicate, and present a sound basis for ideas

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDMP 301: Habitat Design Major Seminar - Materials and Processes (3 Credits)

Class Outline

Through lectures, studio assignments and research, students explore traditional and contemporary materials and manufacturing methods unique to the furnishings industry as well as those common in other fields. Students are introduced to the technical and practical considerations that influence the choices of material and production. Emphasis is placed on the relationship between the designer and manufacturer.

Learning Objectives

1. Explore traditional and contemporary materials and manufacturing methods in the furnishings industry
2. Introduction to the technical and practical considerations that influence the choices of material and production
3. Examine the relationship between the designer and manufacturer

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDFM 301: Habitat Design Major Seminar - Furniture Design Merchandising Principles (3 Credits)

Class Outline:

Through a series of lectures and seminars, this course enables students to identify, challenge and explore new concepts and design competencies within the parameters of markets and opportunities. The course will also address trends and forecasting, patterns of domestic competition, practices in international import and export, packaging, and transport of products. Students will be exposed to case studies covering customer buying systems and hierarchies of needs, behavioural tendencies, cultural diversities, price determinants and market cost factors.

Learning Objectives

1. Identify, challenge and explore new concepts and design competencies within the parameters of markets and opportunities
2. Address trends and forecasting, patterns of domestic competition, practices in international import and export, packaging, and transport of products
3. Analyse case studies covering customer buying systems and hierarchies of needs, behavioural tendencies, cultural diversities, price determinants and market cost factors

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDAL301: Habitat Design Major Seminar - Accessories for Living (3 Credits)

Class Outline

This course explores design, construction and packaging issues associated with the production of accessories for the living environment. Students design, develop and fabricate a product with a focus on efficient production strategies and appropriate integration of assembly processes, including the potential use of various rapid prototyping technologies.

Learning Objectives

1. Explore design, construction and packaging issues associated with the production of accessories for the living environment
2. Design, develop and fabricate a product with relation to efficient production strategies and appropriate integration of assembly processes
3. Explore the potential use of various rapid prototyping technologies

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDDS 302: Habitat Design Studio - Principles of Light (12 Credits)

Class Outline

This course conducts a technical examination of natural and electrical lighting factors but introduces human factors; human physiology and physiology responses to qualitative and quantitative aspects of light and space. The need to control the quality and quantity of light has profoundly affected the organization of architecture and interior space. Students develop an understanding of how human beings react to and interact within light by exploring contemporary theories of perceptual, somatic, and aesthetic responses to light.

Learning Objectives

1. Introduction to human factors; human physiology and physiology and their responses to qualitative and quantitative aspects of light and space
2. Examine the need to control the quality and quantity of light
3. Understand how light affects the organization of architecture and interior space and how human beings react to and interact within light
4. Explore contemporary theories of perceptual, somatic, and aesthetic responses to light

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDLC 302: Habitat Design Major Seminar - Light: Critical Issues (3 Credits)

Class Outline

This course explores a range of approaches and methodologies that have driven architectural and design theory from the late 19th century through the 21st century. In particular, this seminar considers the role of light as a protagonist in many influential design theories and discourses.

Learning Objectives

1. Study approaches and methodologies that have driven architectural and design theory
2. Examine the role of light as a protagonist in many influential design theories

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDPC 302: Habitat Design Major Seminar - Light, Perception & Culture (3 Credits)

Class Outline

This course covers subjective and objective responses to light, the psychological aspects of lighting design, and the impact of energy ethics on lighting decisions. Architectural photography is used to develop students ability to observe light. Study of light in performance (in its theatrical and postmodern expressions) helps students understand evolving cultural perspectives and contemporary representations of identity and social practice.

Learning Objectives

1. Examine psychological aspects of lighting design, and the impact of energy ethics on lighting decisions
2. Develop ability to observe light through photography
3. Understand evolving cultural perspectives and contemporary representations of identity and social practice with respect to light and space

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDSU 302: Habitat Design Major Seminar - Daylight & Sustainability (3 Credits)

Class Outline

This course trains designers to observe, analyze, describe, manipulate, and evaluate daylight and its effect on interior spaces. Topics include methods of calculating and predicting solar motion, the interaction of daylighting with building orientation, interior finishes, window configuration, control devices, and interior and exterior shading. Students are introduced to the impact of lighting strategies on energy consumption, which is central to sustainable architecture.

Learning Objectives

1. Evaluate daylight and its effect on interior spaces
2. Study methods of calculating and predicting solar motion, the interaction of daylighting with building orientation, interior finishes, window configuration etc
3. Introduction to the impact of lighting strategies on energy consumption

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMI 401: Design Minor Studio (12 Credits):
Any IDST -, CDST -, HDST -, DIST -, DMST - , ARDS -

Class Outline

In this course students are asked to take any one design studio from any other design discipline (including Architecture and Mass Communication) on offer. During the semester, the students will also take the support studio/seminars associated with the chosen studio.

Learning Objectives

1. The learning objectives of the chosen studio apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180 Contact Periods

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMC 401: Design Minor Seminar (3 Credits)
Any IDMA-, HDMA -, DIMA -, DMMA -, CDMA -, ARMS -

Class Outline
During the semester, the students will take the support studio/seminars associated with the chosen design studio.

Learning Objectives

1. The learning objectives of the chosen seminar apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180 Contact Periods

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

HDDS 402: Habitat Design Thesis Studio (12 Credits)

Class Outline

This course provides the student the opportunity to propose and manage a faculty approved self-initiated design project with appropriate focus, inquiry, documentation, execution and presentation.
Students in this course advance their design skills to meet the challenge of a complex project. Selecting both client and project, students complete an in-depth precedent study, code and building analysis, user assessment, programming, conceptualization and presentation. Design research methods, innovation, code compliance, sustainability and acoustical comfort are key issues that are addressed.

Learning Objectives

1. In-depth precedent study of code and building analysis, user assessment, programming, conceptualization and presentation
2. Emphasis on focus, inquiry, documentation, execution and presentation
3. Focus on design research methods, innovation, code compliance, sustainability and acoustical comfort

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Industrial Design Pathway

IDDS 201: Industrial Design Studio - Model and Prototype Development (12 Credits)

Class Outline

This course introduces the use of hand tools and workshop equipment to develop rapid study models and mid-fidelity prototypes related to industrial design. Students build study models of products to professional standards of accuracy and finish, with an emphasis on rapid development. All aspects of workshop practice and safety are emphasized.

Learning Objectives

1. Learn to use basic hand tools and workshop equipment
2. Be comfortable in making small prototype models of simple products
3. Balance between accuracy and finish along with speed and rapid development

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDSI 201: Industrial Design Major Seminar - Survey of Industrial Design (3 Credits)

Class Outline

In this course, students focus on the chronological context of the development of the industrial design profession, relating it to the social, cultural and economic events that helped shape our modern day society. Studies are focused on major industrial designers and innovations.

Learning Objectives

1. Learn about the various avenues for industrial design in the market.
2. Familiarize the students with the social, cultural and economic events that helped shape our modern day products.
3. Be aware of major industrial designers and innovations

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDIN201: Industrial Design Major Seminar - Introduction to Industrial Design (3 Credits)

Class Outline

This course introduces students to the industrial design profession. Lectures, discussions and problem solving exercises explore industrial design as a creative process, examine its history and provide insight into professional opportunities in the field.

Learning Objectives

1. Understand industrial design as a creative process
2. Examine the history of industrial design as a discipline
3. Familiarize the students with professional opportunities in the field

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDCR 201: Design Major Seminar - Contextual Research Methods (3 Credits)

Class Outline

This course presents the techniques necessary to conduct relevant and useful research of a novel domain in context. Students are expected to gain knowledge and expertise to contribute to the design process in user-centered products and systems in which user, goals and task needs are given primary importance.

Learning Objectives

1. Learn techniques necessary to conduct relevant and useful research
2. Understand how to adapt research to design
3. Know how the design process can contribute to user-centered products and systems

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDDS 202: Industrial Design Studio - Industrial Design Idea Visualization (12 Credits)

Class Outline

This course develops the drawing skills and 2-D presentation techniques used to convey design ideas in the industrial design profession, including the rapid construction of perspective systems, the ability to sketch quickly and accurately, the use of basic line and weight methods to convey ideation rationale, and the visual representation of product assembly. Additionally, students will learn how to manipulate hand drawn sketches using computer software.

Learning Objectives

1. Drawing skills of free-hand sketching, perspective drawing, drafting etc
2. Learn the use of basic line and weight methods to convey ideation rationale
3. learn how to manipulate hand drawn sketches using computer software
4. Visual representation of product assembly

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDHF 202: Industrial Design Major Seminar - Human Factors in Industrial Design (3 Credits)

Class Outline

This course explores the physical, psychological, perceptual and behavioural characteristics of humans. Through a series of lectures and projects, this information is applied to the field of industrial design to develop safe and effective products.

Learning Objectives

1. Understand the physical, psychological, perceptual and behavioural characteristics of humans
2. Analyse behavioural characteristics to apply to industrial design
3. Develop safe and effective products

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDMA 202: Industrial Design Major Seminar - Manufacturing and Assembly Technology (3 Credits)

Class Outline

This course emphasizes the practical relationship between industrial design and the manufacturing industry as well as the technical considerations that influence the choice of material and process for small batch and mass production.

Learning Objectives

1. Understand the relationship between industrial design and the manufacturing
2. Know the technical considerations that influence the choice of material and process
3. Understand the choice between small batch and mass production

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDCM 202: Industrial Design Major Seminar - Computer Modeling (3 Credits)

Class Outline

This course applies design-based simulation and 3-D modeling to the industrial design process. State-of-the-art software is used as a modeling tool, and computer graphics are used as a communication tool for newly developed products.

Learning Objectives

1. Learn design-based simulation and 3-D modeling for application into the industrial design process
2. Understand software as a modeling tool
3. Understand computer graphics as a communication tool

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDDS 301: Industrial Design Studio - The Development of Product Form (12 Credits)

Class Outline

A sequence of short projects provides students with an opportunity to investigate the design issues associated with familiar mass-produced products and to gain an understanding of design methodology. Projects are developed to enhance working knowledge of the importance of form, and the impact and relevance of visual and physical design decisions.

Learning Objectives

1. Investigate the design issues associated with familiar mass-produced products
2. Gain an understanding of design methodology
3. Develop an enhanced working knowledge of the importance of form
4. Understand the impact and relevance of visual and physical design decisions

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDMK 301: Industrial Design Major Seminar - Industrial Design in the Marketplace (3 Credits)

Class Outline

Through a sequence of research projects, students are required to consider more complex design issues and their corresponding problems. Students work through the product development cycle, and, while they are expected to apply their project skills and technical knowledge to formulate design solutions that are both visually appealing and functional, they also focus on the skills necessary to communicate ideas to engineers, marketing and other stakeholders.

Learning Objectives

1. Consider more complex design issues and their corresponding problems
2. Use project skills and technical knowledge to formulate design solutions
3. Develop skills necessary to communicate ideas to engineers, marketing and other stakeholders

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDSA 301: Industrial Design Major Seminar - Sensory Awareness (3 Credits)

Class Outline

Humans perceive their environments with all of the senses. This course seeks to incorporate that understanding into the design process to provide an understanding of the sensory nature of products and their environments as a whole. Through a sequence of design projects, students learn to consider and anticipate human sensory, perceptional and cognitive abilities. Students work through the product development cycle, gaining an understanding of users' needs and desires based on the acquired sensational knowledge and learn to incorporate that knowledge into the design process for clients, engineers, marketers and other stakeholders.

Learning Objectives

1. Develop an understanding of the sensory nature of products and their environments as a whole
2. Consider and anticipate human sensory, perceptional and cognitive abilities
3. Gain an understanding of users' needs and desires based on the acquired sensational knowledge
4. Incorporate sensory awareness into the design process for clients, engineers, marketers and other stakeholders

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDSE 301: Industrial Design Major Seminar - Design Semantics (3 Credits)

Class Outline

The theory of product semantics is introduced and integrated into projects. Techniques, guidelines and examples illustrate the practical aspects of product semantics. Students are expected to apply both symbol theory and morphological psychology to their projects.

Learning Objectives

1. Illustrate the practical aspects of product semantics
2. Apply symbol theory and morphological psychology to projects

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDDS 302: Industrial Design Studio - Prototype Project Conceptualization (12 Credits)

Class Outline

In this course, students, working in a team environment, research user needs, human factors, aesthetic issues, manufacturing requirements and market demands to identify user needs and product opportunities. Teams use brainstorming and other ideation methodologies to produce and develop numerous design concepts. Students work with industry partners to gain a deep understanding of issues related to the project concept. Student designs are developed through final concept and full-scale mockup.

Learning Objectives

1. Learn to research user needs, human factors, aesthetic issues, manufacturing requirements and market demands
2. Identify user needs and product opportunities while working in a team environment
3. Use brainstorming and other ideation methodologies to produce and develop numerous design concepts
4. Gain a deep understanding of issues related to the project concept

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDPA 302: Industrial Design Major Seminar - Product Animation (3 Credits)

Class Outline

This course addresses industry interest in product simulation using Alias, a high-end 3-D computer software. The class explores product animation and assembling simulation in order to develop an aesthetic of motion. Advanced techniques and methods of creating hyperrealistic images and believable movements are studied.

Learning Objectives

1. Product simulation using Alias
2. Use product animation and assembling simulation to develop an aesthetic of motion
3. Create hyperrealistic images and believable movements

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDIN 302: Industrial Design Major Seminar - Industrial Design Innovation (3 Credits)

Class Outline

This course explores the methods of identifying and developing inventive solutions to a wide range of design problems. Students are presented with design problems concerning user and function, which require them to develop the skills to devise, test and experiment with new design directions and solutions. The course also covers the means of protecting design ideas.

Learning Objectives

1. Identifying and developing inventive solutions to a wide range of design problems
2. Develop the skills to devise, test and experiment with new design directions
3. Explore means of protecting design ideas

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDCP 302: Industrial Design Major Seminar - Commercial Practices for Industrial Design (3 Credits)

Class Outline

Students undertake projects that investigate a broad range of design, marketing and production issues. Project time scales are extended, the need to undertake research is emphasized, and overall project management skills are accentuated. Students are introduced to market-related design issues, product ranging and the key influences in a selection of product series, as well as issues of patent law, project planning, and contract negotiation.

Learning Objectives

1. Investigate a broad range of design, marketing and production issues
2. Introduction to market-related design issues, product ranging and the key influences in a selection of product series
3. Understanding of issues of patent law, project planning, and contract negotiation

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMI 401: Design Minor Studio (12 Credits):
Any IDST -, CDST -, HDST -, DIST -, DMST - , ARDS -

Class Outline

In this course students are asked to take any one design studio from any other design discipline (including Architecture and Mass Communication) on offer. During the semester, the students will also take the support studio/seminars associated with the chosen studio.

Learning Objectives

1. The learning objectives of the chosen studio apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180 Contact Periods

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMC 401: Design Minor Seminar (3 Credits)
Any IDMA-, HDMA -, DIMA -, DMMA -, CDMA -, ARMS -

Class Outline

During the semester, the students will take the support studio/seminars associated with the chosen design studio.

Learning Objectives

1. The learning objectives of the chosen seminar apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

IDDS 402: Industrial Design Thesis Studio (12 Credits)

Class Outline

This course covers the research, design and construction of a full-scale working prototype. In this course, students begin to translate their design concepts into the major systems of the working prototype. Mass production and assembly issues impact the design and must be resolved by students.
Students are involved in the research, design and construction of a full-scale working prototype. In this final course, students complete construction of a working prototype and use the fabrication and assembly process to develop production line concepts. Students document the prototype and construction process.

Learning Objectives

1. Construction of a full-scale working prototype
2. Learn to translate their design concepts into the major systems of the working prototype
3. Use fabrication and assembly process to develop production line concepts
4. Document the prototype and construction process

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Design & Management Pathway

DMDS 201: Design & Management Design Studio - Idea Visualization (12 Credits)

Class Outline

Drawing is the core skill in which designers create, communicate and collaborate. In order to have a commanding presence in interdisciplinary collaborative sessions, the design manager must be proficient in drawing and diagramming in front of a group of people. The result of this proficiency is the emergence of a culture of rapid prototyping as the images produced become 2-D models of a community of ideas. In this course the focus is on real-time sketching and diagramming among groups in order to: enhance right-brain activity; effectively summarize issues; empower and extract ideas from everyone; and foster collaboration through shared imagery.

Learning Objectives

1. Learn real-time sketching and diagramming
2. Effectively summarize issues and empower and extract ideas from everyone
3. Foster collaboration through shared imagery

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMHI 201: Design & Management Major Seminar - History and Interpretation of Innovation (3 Credits)

Class Outline

The history and interpretation of innovation is an important class for students to understand, define and distinguish from creative conjecture. A variety of case studies throughout human history is used to look at various aspects of innovation and causal triggers such as culture, environment, teamwork, adversity, intuition, and ingenuity. Students are asked to compare and contrast historical innovation vs. proclaimed innovation. Students apply their finding toward the development of a personal definition of innovation and the role design management plays in creating the potential for innovation to occur.

Learning Objectives

1. Look at various aspects of innovation and causal triggers such as culture, environment, teamwork, adversity, intuition, and ingenuity
2. Compare and contrast historical innovation vs. proclaimed innovation
3. Develop a personal definition of innovation and the role design management plays in creating the potential for innovation to occur

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMCC 201: Design & Management Major Seminar - Design, Chaos and Complexity (3 Credits)

Class Outline

This course challenges students to develop a precise understanding of how complex systems work and prepares them to apply design thinking in conjunction with concepts from complexity science to effectively manage change. Complexity is defined as "a great many independent agents that are interacting with each other in a great many ways." The course prepares students to develop solutions to so called "wicked problems" that involve multiple systems and players, where the design manger is both an agent of change, working to accelerate the diffusion of new ideas and innovation among disparate groups of individuals and entities, and a manager of the change process.

Learning Objectives

1. Apply design thinking in conjunction with concepts from complexity science to effectively manage change
2. Develop solutions to so called "wicked problems" that involve multiple systems and players
3. Understand the design manger as an agent of change
4. Work towards the diffusion of new ideas and innovation among disparate groups of individuals and entities

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMMS 201: Design & Management Major Seminar - Design Innovation Development and Marketing Strategies (3 Credits)

Class Outline

This course presents the principles of project planning and implementation critical to forming a profitable, successful new business entity. Business plan development, technology transfer, offshore sourcing, and alliances with partners and suppliers are integrated into the student's design skill set toward the end of achieving innovation in the marketplace. Moreover, projects undertaken in this class teach the student to develop original design concepts into commercially, marketed and sold products, communications, environments or services.

Learning Objectives

1. Understand terms such as business plan development, technology transfer and offshore sourcing
2. Develop original design concepts into commercially, marketed and sold products, communications, environments or services
3. Work towards achieving innovation in the marketplace

Learning Strategy

Seminar based Enquiry

Contact Period (in hours)

45

Form of Evaluation

Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMDS 202: Design & Management Design Studio - Facilitating Creative Thinking (12 Credits)

Class Outline

Successful design managers need to be able to create the conditions for creative thinking and innovation within an organization comprised of a wide variety of professionals, most of whom are not familiar with design thinking. This course prepares students to lead teams in the envisioning of new ideas and solutions by developing skills in framing, imaging, and group interaction as they apply the process of design conceptualization outside of the familiar domain of studio skills. In a series of simulations and group exercises, the students acquire experience in idea facilitation through working successfully with non-design people in a creative mode.

Learning Objectives

1. Lead teams in the envisioning of new ideas and solutions by developing skills in framing, imaging, and group interaction
2. Look at design conceptualization outside of the familiar domain of studio skills
3. Experience in idea facilitation through working successfully with non-design people in a creative mode

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMSP 202: Design & Management Design Major Seminar - Sustainable Practices in Design (3 Credits)

Class Outline

Sustainable practice in industry calls for an end to the notion that commerce and the environment are diametrically opposed to each other. Building off of groundbreaking work that reframes world commerce as the only force large enough to enact change at a global level, this course prepares students to apply design thinking to the greatest of all problems: building a sustainable ecologic, economic, and social culture in industry. To this end, design management principles are directed toward the convergence of ideals with reality into a harmonic industry: design.

Learning Objectives

1. Apply design thinking to building a sustainable ecologic, economic, and social culture in industry
2. Direct design management principles toward the convergence of ideals with reality into a harmonic industry
3. Understand that commerce and the environment are diametrically opposed to each other

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMPC 202: Design & Management Design Major Seminar - Studies in Perceptual and Cognitive Human Factors (3 Credits)

Class Outline

Understanding and applying the science of human factors is essential in the design of any solution that is to be used, perceived or operated by a human being. This course explores the physical, psychological, perceptual and behavioral characteristics of humans. Through a series of lectures and projects, this information is applied to Interaction Design to develop usable, desirable and effective products and communications.

Learning Objectives

1. Explore the physical, psychological, perceptual and behavioural characteristics of humans
2. Develop usable, desirable and effective products and communications

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMCD 202: Design & Management Design Major Seminar - Collaboration at a Distance (3 Credits)

Class Outline

Today's global economy demands that tomorrow's professionals be able to manage projects with people and organizations all over the world. Bolstered by the trends in outsourcing, particularly to China, management of design, whether in multi-national companies or in local entrepreneurial ventures, demands that students be prepared to communicate explicitly with their partners and counterparts who they may never meet in person. In this course the student work as a team with partners in international locations to achieve a coordinated resolution to a design project that combines concept exploration, prototyping, production, and marketing into a cohesive feasibility model.

Learning Objectives

1. Work as a team with partners in international locations to achieve a coordinated resolution to a design project
2. Combine concept exploration, prototyping, production, and marketing into a cohesive feasibility model
3. Understand management of design, whether in multi-national companies or in local entrepreneurial ventures
4. Learn to communicate explicitly with partners and counterparts who may never meet in person

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMDS 301: Design & Management Design Studio - Design Management Practical Project (12 Credits)

Class Outline

Through a rigorous project in the management of a complex design process, the student demonstrates the mastery of the issues, methods and tools of design management. Based on a topic developed by the student, the outcome of the design process is manifested in a tangible artifact that satisfies the needs of the customer, market, producer, and organization. Thorough documentation and a formal project presentation, students demonstrate their control of the design process and resolution of conflicting issues related to innovation.

Learning Objectives

1. Mastery of the issues, methods and tools of design management
2. Demonstrate their control of the design process and resolution of conflicting issues related to innovation
3. Understand how the design process is manifested in a tangible artifact that satisfies the needs of the customer, market, producer, and organization

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMBM 301: Design & Management Design Major Seminar - Business and Design Practicum (3 Credits)

Class Outline

In this course, students are presented with case studies and situational projects that emphasize the analysis of business practice pertaining to the design of products, visual communications, environments or services. Plans and proposals are formulated and subjected to the scrutiny of their potential for sustainable business development, feasibility and contribution to people's well-being. Students acquire the vocabulary and structure of commerce as design.

Learning Objectives

1. Analysis of business practice pertaining to the design of products, visual communications, environments or services
2. Analyse the potential of the project for sustainable business development, feasibility and contribution to people's well-being
3. Acquire the vocabulary and structure of commerce as design

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation:
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMIM 301: Design & Management Design Major Seminar - Idea Management in Business (3 Credits)

Class Outline

Design managers must work in the context of and in partnership with the business of product development, marketing and engineering. This course introduces the student to a new way of framing, planning, and presenting their designed concepts as part of an overall business objective. Students are introduced to the concepts of brand, strategic planning, communication and collaboration. Working with knowledge gained from industry, partners and mentors bring firsthand knowledge to students as they develop coherent business practices that guide their subsequent design studio work.

Learning Objectives

1. Framing, planning, and presenting their designed concepts as part of an overall business objective
2. Introduction to the concepts of brand, strategic planning, communication and collaboration
3. Develop coherent business practices that guide subsequent design studio work

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMDF 301: Design & Management Design Major Seminar - Design Futures: Trends, Foresight and Intuition (3 Credits)

Class Outline

This course introduces the student to the nature of trends: their verifiable causes, consequences, and implications. Successfully interpreting trends at both the macro and micro level informs the design manager with foresight: fluid alternative images of futures that form the basis for rational intuition, a blend of left and right brain thinking that speeds up and consensus building and decision making in organizations. Through a series of projects and case studies, students develop their own skills in identifying and framing trends that affect the design enterprise.

Learning Objectives

1. Understand the verifiable causes, consequences, implications and the nature of trends
2. Interpreting trends at both the macro and micro level
3. Develop skills in identifying and framing trends that affect the design enterprise

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMDS302: Design & Management Design Studio - Business Models & Planning (12 Credits)

Class Outline

A comparative study of business models and planning, this course provides students with an understanding of the basic components of all business models and the ability to ask the questions and conduct the research that will enable them to understand how any business is constructed. Topics include internal components (mission and objectives; organizational facilitators and leadership; financial structure, etc.) and external components (external environment and competitive positioning; pricing mechanisms; cultural and geographic landscape, etc.).

Learning Objectives

1. Understanding the basic components of all business models
2. Understand terms like mission and objectives; organizational facilitators and leadership; financial structure

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMBE 302: Design & Management Design Major Seminar - Business Ethics (3 Credits)

Class Outline

Through readings in classic and contemporary ethical literature, and through case studies of real ethical dilemmas, this course examines the moral considerations that students may encounter in management situations, business and creative pursuits.

Learning Objectives

1. Examine the moral considerations that students may encounter in management situations
2. Review of classic and contemporary ethical literature
3. Study case studies of real ethical dilemmas

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMEE 302: Design & Management Design Major Seminar - Design in Everyday Experience (3 Credits)

Class Outline

In this class reading, discussion and exercises focus on analyzing how design shapes and is shaped by everyday experience. These courses are writing- and reading-intensive, encouraging students to develop strength in close reading and analysis, critical thinking and academic writing.

Learning Objectives

1. Analyze how design shapes and is shaped by everyday experience
2. Develop strength in close reading and analysis, critical thinking and academic writing

Learning Strategy

Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)

45

Form of Evaluation

Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMAM 302: Design & Management Design Major Seminar - Advanced Topics in Design & Management (3 Credits)

Class Outline

The intention of this course is to present an overview of the emerging model of social entrepreneurship as well as to review the concurrent theoretical foundations and applications with relevant examples from the literature in the field. As the global marketplace continues to evolve and integrate models of entrepreneurship applied to social causes, such interventions are rapidly gaining both notice and respect as an approach for creating meaningful social change. Students who are versed in the essential skills of management, especially those who have a background in applying these skills creatively, will find this field rich with opportunities. This course is designed to develop students awareness of the field of social entrepreneurship and to provide a basis for pursuing further study or work in this direction.

Learning Objectives

1. Develop awareness of the field of social entrepreneurship
2. Understand the concurrent theoretical foundations and applications with relevant examples from the literature in the field
3. Integrate models of entrepreneurship applied to social causes

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMI 401: Design Minor Studio (12 Credits):
Any IDST -, CDST -, HDST -, DIST -, DMST - , ARDS -

Class Outline
In this course students are asked to take any one design studio from any other design discipline (including Architecture and Mass Communication) on offer. During the semester, the students will also take the support studio/seminars associated with the chosen studio.

Learning Objectives

1. The learning objectives of the chosen studio apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180 Contact Periods

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DEMC 401: Design Minor Seminar (3 Credits)
Any IDMA-, HDMA -, DIMA -, DMMA -, CDMA -, ARMS -

Class Outline

During the semester, the students will take the support studio/seminars associated with the chosen design studio.

Learning Objectives

1. The learning objectives of the chosen seminar apply.

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
180 Contact Periods

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMDS 402: Design & Management Thesis Studio (12 Credits)

Class Outline

All Design & Management students are required to prepare an original thesis that researches an area of their particular focus. The thesis culminates in a comprehensive written document, in conjunction with a conclusive presentation of a design concept, business model, and demonstration of an original methodology.

Learning Objectives

1. Presentation of a design concept, business model, and demonstration of an original methodology
2. Research an area of their particular focus with relation the Management & Design

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Master of Design Curricula

Credits and Contact Period Distribution: M. Des (all pathways)

	Year 1			Year 2		Total
	Term I	**Term II**		**Term III**	**Term IV**	
Foundation Studio						
Major Studio	1 skills studio (6 credits)	1 skills studio (6 credits)		1 skills studio (6 credits)	Thesis studio (9 credits)	
Minor Studio						
Skills Workshop	1 course (3 credits)					
Major Seminar	2 course (6 credits)	2 course (6 credits)		1 course (3 credits)	2 course (6 credits)	
Minor Seminar						
Social Science Elective						
Research and Communication		1 course (3 credits)		1 course (3 credits)		
Humanities Elective						
Computer Skills						
Management Elective						
Total Credits	15	15		12	15	57
Contact Hours	225	225		180	225	855

Design and Management Pathway

DMDS 601: Management Design Studio - Collaborative Culture in Design Organizations (6 credits)

Class Outline

This course provides opportunities to learn and apply organizational and design management theory directly to the management of design organizations. In addition, students participate in classroom exercises that emphasize leadership experience, decision-making, and communication skills.

Learning Objectives

1. leadership experience, decision-making, and communication skills
2. Effectively summarize issues and empower and extract ideas from everyone
3. Learn and apply organizational and design management theory

Learning Strategy
Studio based collaborative learning

Contact Period
90 Contact Periods

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMIM 601: Design & Management Design Major Seminar - Idea Management in Business (3 credits)

Class Outline

Design managers must work in the context of and in partnership with the business of product development, marketing and engineering. This course introduces the student to a new way of framing, planning, and presenting their designed concepts as part of an overall business objective. Students are introduced to the concepts of brand, strategic planning, communication and collaboration. Working with knowledge gained from industry, partners and mentors bring firsthand knowledge to students as they develop coherent business practices that guide their subsequent design studio work.

Learning Objectives

1. Work as a team with partners in international locations to achieve a coordinated resolution to a design project
2. Work in the context of the business of product development, marketing and engineering
3. Understand framing, planning, and presenting their designed concepts
4. Working with knowledge gained from industry, partners and mentors

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 601 - Free Hand Drawing Skills

Class Outline

This skills workshop is designed to explore and learn the fundamental of sketching and communicating ideas quickly and effectively. .

Learning Objectives

1. Demonstrate familiarity with basic drawing terms, tools, media and technique
2. Select frame and compose from relatiy to paper format
3. Recognise and manipulate negative / positive shapes and space with control variables
4. Perceive and utilize a full range of values for describing form, depth, structure while integrating these things into the forms surrounding space.
5. To understand line quality and its variations.
6. To understand Line quality and expressiveness.
7. Compose drawings
8. To use effective techniques to form objects and fragment them with environmental integration creating a sense of implies energy and motion.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMDV 601: Design & Management Major Seminar - Design Value & Management (3 credits)

Class Outline

This module provides you with general design management theory, including both design and management principles, and explores a variety of possible applications of design management in industry. The module will enable you to explore the value of working in multi-disciplinary design teams, innovation and creativity and their relationship to business success. You will gain practical experience of team working and project management through working on a live brief. This experience will be underpinned by your own research and current research in the field. You will be asked to reflect on the management of the design process, the strategy, the roles of the team members and the effectiveness of their collaboration.

Learning Objectives

1. Understand what is the role of design in business
2. Use of design as a strategic tool to create competitive advantage
3. Consider how design is linked to business value and innovation

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
45

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMDS 602: Design & Management Design Studio - Facilitating Creative Thinking (6 Credits)

Class Outline

Successful design managers need to be able to create the conditions for creative thinking and innovation within an organization comprised of a wide variety of professionals, most of whom are not familiar with design thinking. This course prepares students to lead teams in the envisioning of new ideas and solutions by developing skills in framing, imaging, and group interaction as they apply the process of design conceptualization outside of the familiar domain of studio skills. In a series of simulations and group exercises, the students acquire experience in idea facilitation through working successfully with non-design people in a creative mode.

Learning Objectives

1. Lead teams in the envisioning of new ideas and solutions by developing skills in framing, imaging, and group interaction
2. Look at design conceptualization outside of the familiar domain of studio skills
3. Experience in idea facilitation through working successfully with non-design people in a creative mode

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMRD 602–Research Methods Seminar (3 credits)

Class Outline

This particular course is designed to function both as an introduction to questions of research and methodology as well as one which culminates in a seminar presentation of a particular topic. The course shall begin with an overview of what is research, why do research, what are the different kinds of research and then move on to specific exercises which will help you to answer questions like how do I find a topic, where do I find information on it, what do I do when I find it? Eventually one hopes that this course is able to bring us to a certain understanding of how one undertakes and brings to a successful fruition an academic research paper.

Learning Objectives

1. Understanding the questions of research
2. Introduction to different aspects of research such as, asking the right questions, framing the argument, listing sources, bibliography etc
3. Exposure to different sources of information and how to access them

Learning Strategy

Seminar based Enquiry

Contact Period (in hours)

45

Form of Evaluation

Term Paper

Method of Evaluation

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMCC 602: Design & Management Major Seminar - Design, Chaos and Complexity (3 Credits)

Class Outline

This course challenges students to develop a precise understanding of how complex systems work and prepares them to apply design thinking in conjunction with concepts from complexity science to effectively manage change. Complexity is defined as "a great many independent agents that are interacting with each other in a great many ways." The course prepares students to develop solutions to so called "wicked problems" that involve multiple systems and players, where the design manger is both an agent of change, working to accelerate the diffusion of new ideas and innovation among disparate groups of individuals and entities, and a manager of the change process.

Learning Objectives

1. Apply design thinking in conjunction with concepts from complexity science to effectively manage change
2. Develop solutions to so called "wicked problems" that involve multiple systems and players
3. Understand the design manger as an agent of change
4. Work towards the diffusion of new ideas and innovation among disparate groups of individuals and entities

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMIP 602: Design & Management Design Major Seminar - Creative Thinking and Intellectual Property (3 credits)

Class Outline

The module provides students with experience of concepts and principles of design based divergent and convergent thinking methods. It uses design based thinking tools in a wide business context. It will include lectures covering key principles and concepts leading on to the case study application of creative tools through seminars and group work. Students will be asked to demonstrate skills such as analysis, parameter mapping, concept modelling and communication. Students will learn how to identify and manage intellectual property rights. The role, strength and dependability of Copyright, Design, Trademark and Patent protection will be explored through case study in relation to the legal framework.

Learning Objectives

1. Introduction to Mind Mapping, Mental Modelling, Radiant Mapping, Universals and Communication Concepts
2. Understand theoretical approaches (for example Design Value, Concept Generation and Problem Space) that become a mechanism and major thinking tool
3. Examine the process for innovation and the development of IP
4. Learn how to identify and manage intellectual property rights

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45 Contact Periods

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMDS 701: Design & Management Design Studio - Business Models & Planning (6 Credits)

Class Outline:

A comparative study of business models and planning, this course provides students with an understanding of the basic components of all business models and the ability to ask the questions and conduct the research that will enable them to understand how any business is constructed. Topics include internal components (mission and objectives; organizational facilitators and leadership; financial structure, etc.) and external components (external environment and competitive positioning; pricing mechanisms; cultural and geographic landscape, etc.).

Learning Objectives

1. Understanding the basic components of all business models
2. Understand terms like mission and objectives; organizational facilitators and leadership; financial structure

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMRD 701–Research Methods Seminar (3 credits)

Class Outline

This particular course is designed to function both as an introduction to questions of research and methodology as well as one which culminates in a seminar presentation of a particular topic. The course shall begin with an overview of what is research, why do research, what are the different kinds of research and then move on to specific exercises which will help you to answer questions like how do I find a topic, where do I find information on it, what do I do when I find it? Eventually one hopes that this course is able to bring us to a certain understanding of how one undertakes and brings to a successful fruition an academic research paper.

Learning Objectives

1. Understanding the questions of research
2. Introduction to different aspects of research such as, asking the right questions, framing the argument, listing sources, bibliography etc
3. Exposure to different sources of information and how to access them

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMRP 701: Design & Management Design Major Seminar - Reflective Practice (3 credits)

Class Outline

This module enables the design practitioner to reveal and understand their implicit design knowledge (what they know) and to develop self-awareness of related issues.
It provides a framework for students to uncover and interrogate their knowledge, and understand their actions in order to support their ability to understand their own situation and evaluate the consequences of their actions in order to improve their professional practice.
The module enables the design practitioner to develop knowledge of the application of action research reflective practice methods in the context of their sphere of practice. The content involves the use of reflective practice case studies. The module acknowledges the designer as an integral part of the design space and explores the relationship between the designer's choice and sustainable design practice.

Learning Objectives

1. Develop knowledge of the application of action research reflective practice methods
2. Provide a framework for students to uncover and interrogate their knowledge, and understand their actions
3. Develop self-awareness of related issues
4. Explore the relationship between the designer's choice and sustainable design practice

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMIC 701: Design & Management Design Major Seminar - Intercultural Communication (3 credits)

Class Outline

This module will help students understand the concepts of 'identity', 'representation', 'otherisation' in relation to working and learning in an intercultural context.
It focuses on developing skilled communication strategies and principles for working in cross-cultural contexts. Key theoretical concepts of identity, otherisation and representation will be introduced through lectures and seminars in order to explore the complex interrelationships between identity, culture and communication.

Learning Objectives

1. Understand what is culture? How are cultural identities constructed? How do cultural stereotypes impact on communication?
2. How are meanings negotiated? And how are these questions related to working as a contemporary designer?
3. Explore key concepts such as identity, otherisation and representation
4. Explore the complex interrelationships between identity, culture and communication

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMDS 702: Management Design Studio - Design Management Thesis (12 credits)

Class Outline

All design management students are required to prepare an original thesis that researches an area of their particular focus. The thesis culminates in a comprehensive written document, in conjunction with a conclusive presentation of a design concept, business model, and demonstration of an original methodology.

Learning Objectives

1. Presentation of a design concept, business model, and demonstration of an original methodology
2. Research an area of their particular focus with relation the Management & Design

Learning Strategy

Studio based collaborative learning

Contact Period

180 Contact Periods

Form of Evaluation

Desk-criticism based continuous evaluation, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMBE 702: Design & Management Design Major Seminar - Business Ethics (3 Credits)

Class Outline

Through readings in classic and contemporary ethical literature, and through case studies of real ethical dilemmas, this course examines the moral considerations that students may encounter in management situations, business and creative pursuits.

Learning Objectives

1. Examine the moral considerations that students may encounter in management situations
2. Review of classic and contemporary ethical literature
3. Study case studies of real ethical dilemmas

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

DMEE 702: Design & Management Design Major Seminar - Design in Everyday Experience (3 Credits)

Class Outline

In this class reading, discussion and exercises focus on analyzing how design shapes and is shaped by everyday experience. These courses are writing- and reading-intensive, encouraging students to develop strength in close reading and analysis, critical thinking and academic writing.

Learning Objectives

1. Analyze how design shapes and is shaped by everyday experience
2. Develop strength in close reading and analysis, critical thinking and academic writing

Learning Strategy
Seminar based Enquiry / Studio based Collaborative Learning

Contact Period (in hours)
45

Form of Evaluation
Term Paper/ Report, Jury Presentation

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

Audio Visual Design Pathway

Course and Credit Structure

	Year 1			Year 2		Total
	Term I	**Terms II**		**Term III**	**Term IV**	
Foundation Studio	1 studio (6 credits)	1 studio (6 credits)				
Project	Photography Project (5 credits)	Audio Design Project (6 credits)				
Support Seminar		1 course (3 credits)	Internship (10 Credits)	Visual Design Project (6 credits)	Final Project (9 credits)	
Major Seminar				1 course (3 credits)		
Skills workshop	1 course (2 credits)					
Social Science Seminar						
Research and Communication	1 course (2 credits)				1 course (3 credits)	
Humanities Seminar						
Computer Skills				I course (3 credits)	1 course (3 credits)	
Management Seminar				1 course (3 credits)		
Total Credits	15	15	10	15	15	70
Contact Hours	225	225	150	225	225	1050

FNDS 001- Sound and Image Studio

Class Outline

This studio is designed to explore concept and creation of works in sound and image using analog and digital means. The studio will introduce to students mixed media techniques in the virtual and real world. The studio will work towards the creation of original works in audio, video interactivity in many contexts.

Learning Objectives

1. To explore basic principles relations to the (re) production of sound and image.
2. To understand the basic methods of audio recording and (re)generation.
3. To understand basic methods of image (re)generation and photographic capture.
4. To understand interactivity between sound, image and context.
5. To learn to produce original design and artistic installations (both linear and interactive) using sound, image and context.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
90 Contact Periods

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 002 - Animation and Storyboarding Studio

Class Outline

This studio is designed to introduce to students the art of giving life to objects through motion and storytelling. The course emphasizes foundational principles of motion, visual storytelling, non-linear forms of motion, interactive visualizing, and diverse approaches to motion graphics.

Learning Objectives

1. To understand the basic principles of Motion.
2. To understand the methods of linear and interactive Visual Storytelling.
3. To understand non-linear, and algorithmic motion.
4. To explore the diverse aesthetic approaches to motion graphics, traditional and digital.
5. The possibilities and relation of motion to time..

Learning Strategy

Studio based collaborative learning

Contact Period (in hours)

90 Contact Periods

Form of Evaluation

Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation

Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 003: Introduction to Computer Skills

Class Outline

This skills workshop explores and introduces students the fundamentals of computer software, their application to design and the knowledge and understanding of how computer applications can assist the production and practice of architecture.

Learning Objectives

1. Knowledge and understanding of the contextual computer software, clothing and allied industries.
2. Basic skills in AutoCAD, Adobe Photoshop, Adobe InDesign etc
3. Practical skills in the application and manipulation of computer software for architectural practice
4. Knowledge and Understanding of functional and aesthetic requirements of architecture and the application of those in virtual environments.
5. Skills in experimentation, critical analysis and the discriminatory selection of computer software for specific end uses.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 005 - Basic Materials Skills Workshop: Camera

Class Outline:

This skills workshop is designed to introduce the students to basic skills required to handle still and video camera. The overall aim is that the students not only familiarize themselves to the various technical aspects of the equipments abut also to instruct them on the concretization of the concepts through visual means.

Learning Objectives

1. To demystify the process of filming and photography.
2. To instruct students in camera dynamics, that is, uses of different components and their camera interplay.
3. To instruct students in the basic principle skills of photography and filming.
4. To instruct students in camera movement, composition and creative use of lighting.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60 Contact Periods

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 006 - Basic Materials Skills Workshop: Sound

Class Outline

This skills workshop is designed to introduce the students to basic characteristics of sound, basic and proficient equipments, the technique of recording, reproducing and mixing.

Learning Objectives

1. To train the students' ear for sound perception.
2. To familiarise the students with equipments of sound.
3. To train the students to be able to create sound perceptive.
4. To train the students to be able to create sound design for various media.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

RNCU 102–Research Methods Seminar (2 credits)

Class Outline

This particular course is designed to function both as an introduction to questions of research and methodology as well as one which culminates in a seminar presentation of a particular topic. The course shall begin with an overview of what is research, why do research, what are the different kinds of research and then move on to specific exercises which will help you to answer questions like how do I find a topic, where do I find information on it, what do I do when I find it? Eventually one hopes that this course is able to bring us to a certain understanding of how one undertakes and brings to a successful fruition an academic research paper.

Learning Objectives

1. Understanding the questions of research
2. Introduction to different aspects of research such as, asking the right questions, framing the argument, listing sources, bibliography etc
3. Exposure to different sources of information and how to access them

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
30

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

MDPH 601: Photography (5 Credits)

Class Outline

Photography is an art and science. This class will deal with teaching photography as means of visual communication. This class will introduce students to various technical & aesthetic concepts related to photography like intricacies of optics and aesthetics, frames and shots, various other technical aspects of camera language. It will introduce students to various artistic endeavours. This class will also deal with properties of light and its creative use in the field of photography. This class will enhance the technical ability to achieve the creative goals in still photography.

Learning Objective

1. To familiarize the students with the scientific and technological development related to camera, viz., from pin hole to digital.
2. Develop a strong sense for visual language
3. To make the student proficient in understanding the various components, accessories, mechanism and operation of camera.
4. Understanding the interface between science and art for achieving different photographic goals.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
75

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDPR 601- Audio Designing Project (6 Credits)

Class Outline

This class will give good understanding about creative use of sound in a project, the basic technical skills for sound recording. Process of sound designing, conceptual approaches to sound, sound plots, cue synopses, music underscoring, atmospheric sound, spot effects, Speaker placement will also be dealt with. This class will also deal with types of sound design delivery systems: live sound effects, microphone techniques, digital audio recording software, and digital audio playback software.

Learning Objective

1. Understanding audio medium and perception of sound.
2. Understanding of creativity in audio medium.
3. To familiarize with process and approaches of sound designing.
4. Better understanding of technical and aesthetic of outdoor and studio based audio designing.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
90

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDAU 602- Audiography (3 Credits)

Class Outline

This class will deals with the techniques and aesthetics of sound recording. This class will also discuss sound perspective, recording, production, re-production of sound, acoustics, microphones and technique of sound editing and mixing.

Learning Objective

1. To familiarize with technical aspects of sound recording in a studio situation.
2. To familiarize different technical aspects of sound recording in outdoor.
3. To empower the students technical know how, to achieve the creative and aesthetic target.
4. Ability to make creative use of sound for various media.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
45

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDPR 602- Visual Designing Project (6 Credits)

Class Outline

This class will deals with various components required for a television production. The stages of production from conceptualization to the final product will be dealt with. This will include camera dynamics, creative use of lighting, understanding of color, texture, sets and props etc. and the editing.

Learning Objective

1. Familiarize with different aspects of TV production such as pre-production, production and post- production.
2. Develop technical skills for indoor and outdoor situation.
3. Understanding of multicam production and working in PCR.
4. To enable to produce their television programmes of different genres.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
90

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDPS 701- TV Production Skills (3 Credits)

Class Outline

This class will deals with the interpretation and perception of audio visual medium. Different styles and techniques of product and post production will also be dealt with. The perception about sound, light, audio video recording in different modes like online and offline will be developed.

Learning Objective

1. To build a perception of sound for television medium.
2. Familiarize with technical skills required for video editing.
3. Understanding of different techniques of audio video editing.
4. Familiarize with online and offline techniques of editing.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
45

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDPR 702- Final Project (9 credits)

Class Outline

The final project represents the culmination of the master's programme. Students are expected to work on an original project that shall combine the knowledge learnt over the 2 years. The emphasis of the final project is on the students developing their own stake and position within the practices as well as theoretical structures that complies their disciplinary domain.

Learning Objective

1. To enhance their understanding about all the aspects needed to complete the project.
2. To develop their own ideas and perspective about the field and make themselves professionals.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
135

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

Annexure-VIII-C of Agenda Item no. 6.7

Bachelor of Journalism and Mass Communication Curricula

Course and Credit Structure

	Year I			Year 2			Year 3		Total
	Term I	**Term II**		**Term III**	**Term IV**		**Term V**	**Term VI**	
Foundation Studio	I studio (12 credits)	I studio (12 credits)							
Project				Print Media Production (12 credits)	Broadcast Media: Radio Production (12 credits)		Broadcast Media: Television Production (12 credits)	1 Thesis (19 credits)	
Support Seminar				1 course (4 credits)	2 course (6 + 2 credits)		I course (4 credits)		
Major Seminar	3 Courses (6 credits)	2 Courses (4 +2 credits)		2 courses (4 credits)			I course (3 credits)		
Skills workshop	2 course (8 credits)	2 courses (8 credits)	National/International Tour (10 Credits)						
Social Science Seminar				Contemporary Concerns and Issues (3 credits)	1 course (3 credits)			1 course (3 credits)	
Research and Communication	1 course (2 credits)	1 course (2 credits)							
Humanities Seminar				I course (3 credits)			I course (3 credits)	I course (3 credits)	
Computer Skills					Advanced Comp Skills (3 credits)				
Management Seminar							I course (3 credits)		
Total Credits	26	26	10	26	26		25	25	164
Study Hours	390	390	150	390	390		375	375	2460

FNDS 001- Sound and Image Studio

Class Outline

This studio is designed to explore concept and creation of works in sound and image using analog and digital means. The studio will introduce to students mixed media techniques in the virtual and real world. The studio will work towards the creation of original works in audio, video interactivity in many contexts.

Learning Objectives

1. To explore basic principles relations to the (re) production of sound and image.
2. To understand the basic methods of audio recording and (re)generation.
3. To understand basic methods of image (re)generation and photographic capture.
4. To understand interactivity between sound, image and context.
5. To learn to produce original design and artistic installations (both linear and interactive) using sound, image and context.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 002 - Animation and Storyboarding Studio

Class Outline

This studio is designed to introduce to students the art of giving life to objects through motion and storytelling. The course emphasizes foundational principles of motion, visual storytelling, non-linear forms of motion, interactive visualizing, and diverse approaches to motion graphics.

Learning Objectives

1. To understand the basic principles of Motion.
2. To understand the methods of linear and interactive Visual Storytelling.
3. To understand non-linear, and algorithmic motion.
4. To explore the diverse aesthetic approaches to motion graphics, traditional and digital.
5. The possibilities and relation of motion to time..

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 003 - Colour, and Texture Studio

Class Outline

This studio is designed to introduce to students the fundamentals of color and texture. of working with 3-dimensional form and space. The emphasis of the course is also on the production of 3-dimensional form using a variety of materials, hard, soft, and or ephemeral

Learning Objectives

1. To understand the generation and the language of 3 D form and space
2. To understand the experience of 3 D Form and space from a variety of perspectives
3. To understand the relationship between objects and the spaces they occupy and produce
4. The relationship of human body in & to space
5. The possibilities and limitations of materials to form

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 004 - Form and Space Studio

Class Outline

This studio is designed to introduce to students the basics of working with 3-dimensional form and space. The emphasis of the course is also on the production of 3-dimensional form using a variety of materials, hard, soft, and or ephemeral

Learning Objectives

1. To understand the generation and the language of 3 D form and space.
2. To understand the experience of 3 D Form and space from a manifold standpoints.
3. To understand the relationship between objects and the spaces they occupy and produce.
4. The relationship of human body in & to space.
5. The possibilities and limitations of materials to form.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 003: Introduction to Computer Skills

Class Outline

This skills workshop explores and introduces students the fundamentals of computer software, their application to design and the knowledge and understanding of how computer applications can assist the production and practice of architecture.

Learning Objectives

1. Knowledge and understanding of the contextual computer software, clothing and allied industries.
2. Basic skills in AutoCAD, Adobe Photoshop, Adobe InDesign etc
3. Practical skills in the application and manipulation of computer software for architectural practice
4. Knowledge and Understanding of functional and aesthetic requirements of architecture and the application of those in virtual environments.
5. Skills in experimentation, critical analysis and the discriminatory selection of computer software for specific end uses.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 005 - Basic Materials Skills Workshop: Camera

Class Outline

This skills workshop is designed to introduce the students to basic skills required to handle still and video camera. The overall aim is that the students not only familiarize themselves to the various technical aspects of the equipments abut also to instruct them on the concretization of the concepts through visual means.

Learning Objectives

1. To demystify the process of filming and photography.
2. To instruct students in camera dynamics, that is, uses of different components and their camera interplay.
3. To instruct students in the basic principle skills of photography and filming.
4. To instruct students in camera movement, composition and creative use of lighting.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 006 - Basic Materials Skills Workshop: Sound

Class Outline

This skills workshop is designed to introduce the students to basic characteristics of sound, basic and proficient equipments, the technique of recording, reproducing and mixing.

Learning Objectives

1. To train the students' ear for sound perception.
2. To familiarise the students with equipments of sound.
3. To train the students to be able to create sound perceptive.
4. To train the students to be able to create sound design for various media.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 001 - Basic Materials Skills Workshop: Wood, Metal and Clay

Class Outline

This skills workshop is designed to familiarize students with basic working and skills of Clay, Metal and Wood. The Studio shall focus on working with these three materials starting from its rough, unprepared stage to a simple finished product.

Learning Objectives

1. Understanding the nature of Wood, Metal and Clay.
2. Preparatory process of Wood, Metal and, Clay
3. Introduction to hand and machine-operated tools for Clay, Metal and Wood
4. Impart knowledge of basic production process of Clay, Wood and Metal.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation:
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 002 - Basic Materials Skills Workshop: Textile and Fabric

Class Outline

This skills workshop explores and introduces students the fundamental of fabrics and textiles, their production processes and the knowledge and understanding of functional and aesthetic requirements of textiles for a range of applications.

Learning Objectives

1. Knowledge and understanding of the contextual textile, clothing and allied industries.
2. Appreciation of significance of textiles in society
3. Practical skills in the production and manipulation of textile through use of appropriate means: weaving, knitting, printing, and embroidery.
4. Knowledge and Understanding of functional and aesthetic requirements of textiles for a range of applications.
5. Skills in experimentation, critical analysis and the discriminatory selection of textiles for specific end uses.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60 Contact Periods

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

SKWP 004 - Free Hand Drawing Skills

Class Outline

This skills workshop is designed to explore and learn the fundamental of sketching and communicating ideas quickly and effectively.

Learning Objectives

1. Demonstrate familiarity with basic drawing terms, tools, media and technique
2. Select frame and compose from reality to paper format
3. Recognise and manipulate negative / positive shapes and space with control variables
4. Perceive and utilize a full range of values for describing form, depth, structure while integrating these things into the forms surrounding space.
5. To understand line quality and its variations.
6. To understand Line quality and expressiveness.
7. Compose drawings
8. Use effective techniques to form objects and fragment them with environmental integration creating a sense of implies energy and motion .

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

RNCU 101–Freshman Writing Seminar (2 credits)

Class Outline

This course is designed to introduce the student to the methods and materials of academic writing. Through the use of reading journals, in-class writing exercises, homework, and essays, the course will explore a variety of ways to craft an essay, take notes on reading material, and respond critically to the material one reads.
This course has two components. The first is learning about the variety of essays one may write for academic and professional purposes. Examples of these are writing from experience, writing to compare, and writing about issues. The second is identifying themes common among the various essays we read.

Learning Objectives

1. The ability to read significant texts carefully and critically, recognizing and responding to argumentative positions.
2. The ability to write sustained, coherent and persuasive arguments on significant issues that arise from the content at hand.
3. The ability to write clearly, following the conventions of Standard English

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
30

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

RNCU 102–Research Methods Seminar (2 credits)

Class Outline

This particular course is designed to function both as an introduction to questions of research and methodology as well as one which culminates in a seminar presentation of a particular topic. The course shall begin with an overview of what is research, why do research, what are the different kinds of research and then move on to specific exercises which will help you to answer questions like how do I find a topic, where do I find information on it, what do I do when I find it? Eventually one hopes that this course is able to bring us to a certain understanding of how one undertakes and brings to a successful fruition an academic research paper.

Learning Objectives

1. Understanding the questions of research
2. Introduction to different aspects of research such as, asking the right questions, framing the argument, listing sources, bibliography etc
3. Exposure to different sources of information and how to access them

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
30

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

MCUM 101- Understanding Media (2 Credits)

Class Outline

This class will trace with the evolution of communication in various contexts, such as historical, social, technological and business. It will deal with development and growth of communication starting from signs & symbols, oral to print & electronics communication. It will also discuss the latest technological advances in the field of mass communication.

Learning Objectives

1. To understand the historical context of evolution of the communication
2. Understanding the role, played by technology and its impact on society, polity and economic sphere.
3. Building a broader perspective about communication process.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPM 101- Principles of Mass Communication (2 Credit)

Class Outline

A detailed understanding of Communication and Mass Communication theories along with elements that constitute them will be dealt in this class. This class will also deal with interpreting the process of mass communication through various schools of approaches such as Aristotelian, Gandhian, Liberatarian to Marxism etc. along with other contemporary approaches.

Learning objective

1. Building a broader perspective of communication and its process.
2. Getting an insight towards various models of mass communication.
3. Understanding theories of mass communication, its critique and application.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCIA 101- Introduction to Advertising (2 Credits)

Class Outline

This class will help students to develop concepts that are able to address the desires as well as aspirations of the consumer base. This class shall also help students understand consumer behaviour, brand promotion etc. through media including new media for an advertising.

Learning objective

1. Familiarize with psychological and cultural approach of advertisement for different media.
2. Understanding of different segment and categories of advertisement.
3. Understanding of means & methods to achieve desired creativity in an advertisement.
4. Familiarize with various aspects of advertising

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
30

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCML 201- Media Law and Regulations (2 Credits)

Class Outline

This class will deal with press laws and ethical issues practiced in media. Rules and laws for media organizations and the Regulatory bodies of the Print and Electronic media will be discussed in the class.

Learning Objective

1. Familiarize with legal aspects in media
2. Understanding of press laws and media ethics applied for media organizations and professionals
3. An insight into the self-censorship, freedom of speech and expression.
4. Familiarize with cyber laws and current issues in today's circumstances.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPR 201- Print Production Project (12 Credits)

Class Outline

This class will deal with enhancement of skills required to produce newspapers and magazines. Different aspects of newsroom activities such as reporting, copy writing, editing, page layout etc. will be discussed in the class.

Learning objective

1. Understanding of news worthiness in different contexts, situations and areas.
2. Familiarize with organogram of print media house.
3. Understanding of the technical know-how of newspaper production.
4. To develop the ability and skill of writing, reporting and editing in different and varied styles.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
180

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCCC 201- Contemporary Concerns and Issues (3 Credits)

Class Outline

This class will deal with socio, political, economic and cultural and development issues through seminars. An empirical overview of problematic conditions (e.g., poverty, violence, crime, inequalities related to racism sexism, and ageism, and imperfections in the major social institutions of family, education, and criminal justice) in the India and other societies will be presented, along with some discussion of major theoretical paradigms that may be applied to the study of social problems within the field of sociology and mass media.

Learning objective

1. Familiarize with different school of thoughts to understand social problems
2. Develop the understanding towards society, polity and culture.
3. Perspective to deal with the contemporary issues

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
45

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCWM 201- Writing for Media-I (4 Credits)

Class Outline

This class will deal with acquiring effective writing skills required for good writing, exclusively for print media. This class will also familiarize the students to various writing styles and copy editing techniques for print media.

Learning Objective

1. To familiarize students with basic writing skills for print media
2. Understanding of varied and diverse styles of writing in practice for print media
3. This class will also help students to enhance the writing skills for print media.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
60

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPR 202- Broadcast Media: Radio Production Project (12 Credit)

Class Outline

The studio teaching will deal with various elements of radio production process. Beginning with conceptualization of the radio programme, various stages of the production process keeping in view the nature of audience and the zone of broadcast will also be dealt with.

Learning objectives

1. To familiarize the students with the medium of radio.
2. Understanding of sound perception and acoustics
3. To familiarize with technical aspects of sound recording in a studio situation.
4. To familiarize different technical aspects of sound recording in outdoor.
5. Technical and aesthetical approach to produce radio programme in a studio as well as outdoor.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
180

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCAU 202- Audiography (6 Credits)

Class Outline

This class will deal with the science and art of sound. Perception of sound, recording, production, re-production of sound, acoustics, microphones and art of sound editing and mixing will also be dealt with.

Learning objective

1. Familiarize with various technical aspects of sound recording involve in a studio situation.
2. Familiarize with different technical aspects of sound recording in outdoor situations.
3. Familiarize with audio editing skills and re-production of sound.
4. Understanding to use the technical knows how to achieve the creative and aesthetic target.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
90

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCWM 202- Writing for Media – II (2 Credits)

Class Outline

This deals with acquiring effective writing skills required for good writing for Audio and Visual media. It will also familiarize the students to various writing styles for Audio/Visual media.

Learning objective

1. Familiarize with different aspects of writing skills for Audio and Visual media.
2. Understand the varied and diverse writing for Audio/Visual medium.
3. Different approaches to meet goal through creative and objective writing.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
30

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

COAA 202- Advance Animation Graphics (3 Credits)

Class Outline

This class will deal with the fundamentals of computer software, their application in different media. The class will also ensure students undergo a survey of various computer applications that are available, understand the ideological premise of the software, and how professionals use them, and their scope and limitations.

Learning objective

1. Knowledge and understanding of the contextual computer software for media industries.
2. Basic skills in Adobe Photoshop, After Effect, 3-D Max etc
3. Knowledge and Understanding of functional and aesthetic requirements of media and the application of those in virtual environments.
4. Skills in experimentation, critical analysis and the discriminatory selection of computer software for specific end uses.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
45

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPR 301- Broadcast Media: TV Production Project (12 Credits)

Class Outline

This class will deal with various aspects and elements required for a television production. The stages of production from conceptualization till the editing and final product will be dealt with. This will include camera dynamics, creative use of lighting, understanding of sets and props. Creative use of sound and pacakaging

Learning objective

1. Familiarize with the various aspects of TV production.
2. Understanding of techniques and grammar of fiction and non-fiction programmes.
3. Familiarize with camera dynamics, techniques and creativity in lighting, sets and props etc.
4. Understanding of studio recording and coordination with PCR
5. Familiarize with multicam recording techniques.
6. Enable students to produce their television programme.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
180

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCBP 301- Broadcast Production Skill (4 Credits)

Class Outline

This deals with the different styles of positioning of the visuals to give varied and different interpretation and meaning. This will further discuss various choices and methods in practice. The perception of sound, light, audio video recording in different modes like online and offline will be given.

Learning objective

1. Familiarize the concept of online and offline video editing.
2. Familiarize with skills and techniques of video editing.
3. Understanding of various video editing software and creative use.
4. Discuss contemporary need and requirement of the industry.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
60

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCOM 301- Online Media (3 Credits)

Class Outline

This class will deal with different streams of online media. Convergence of idea, ideologies and technologies will also be dealt with. This will strengthen the concept of media ownership, where media of cross companies encourage cross promotional and content sharing among print, online and TV platform owned by the same company.

Learning objective

1. Understanding of the online media in totality.
2. Familiarize the phenomenon of convergence and online journalism
3. Skills to use the multiple media for an individual or collective expression.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
45

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPR 302- Final Project (19 Credits)

Class Outline

This deals with the practical training of the students wherein they will apply the knowledge of Print and electronic media, learnt in earlier classes.

Learning objective

1. This class will enhance the students' practical applicability of theoretical knowledge.
2. This will concentrate using Print, Radio, TV or online media in order to complete the project.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-3
Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: Internal expert	Assessment level: External expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

Annexure-VIII-D of Agenda Item no. 6.7

Master of Journalism and Mass Communication Curricula

Course and Credit Structure

	2011-12			2012-13			Total
	Term I	**Term II**		**Term III**	**Term IV**		
Foundation Studio	1 studio (6 credits)	1 studio (6 credits)					
Project	Print Media Production (8 credits)	Broadcast Media: Radio Production (8 credits)		Broadcast Media Television Production (12 credits)	Final Project (20 credits)		
Support Seminar	1 course (2 credits)	1 course (4 credits)		1 course (6 credits)			
Major Seminar	3 Courses (2+2+2 credits)	2 Courses (4 credits)	Internship (10 credits)	3 courses (4+1+1 credits)		National & International Tour (10 credits)	
Skills workshop							
Social Science Seminar					1 course (2 credits)		
Research and Communication	1 course (2 credits)	1 course (2 credits)					
Humanities Seminar				I course (2 credits)	1 course (2 credits)		
Computer Skills							
Management Seminar					1 course (2 credits)		
Total Credits	26	26	10	26	26	10	124
Study Hours	390	390	150	390	390	150	1860

FNDS 001- Sound and Image Studio

Class Outline

This studio is designed to explore concept and creation of works in sound and image using analog and digital means. The studio will introduce to students mixed media techniques in the virtual and real world. The studio will work towards the creation of original works in audio, video interactivity in many contexts.

Learning Objectives

1. To explore basic principles relations to the (re) production of sound and image.
2. To understand the basic methods of audio recording and (re)generation.
3. To understand basic methods of image (re)generation and photographic capture.
4. To understand interactivity between sound, image and context.
5. To learn to produce original design and artistic installations (both linear and interactive) using sound, image and context.

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

FNDS 002 - Animation and Storyboarding Studio

Class Outline

This studio is designed to introduce to students the art of giving life to objects through motion and storytelling. The course emphasizes foundational principles of motion, visual storytelling, non-linear forms of motion, interactive visualizing, and diverse approaches to motion graphics.

Learning Objectives

1. To understand the basic principles of Motion.
2. To understand the methods of linear and interactive Visual Storytelling.
3. To understand non-linear, and algorithmic motion.
4. To explore the diverse aesthetic approaches to motion graphics, traditional and digital.
5. The possibilities and relation of motion to time..

Learning Strategy
Studio based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk-criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

RNCU 101–Freshman Writing Seminar (2 credits)

Class Outline

This course is designed to introduce the student to the methods and materials of academic writing. Through the use of reading journals, in-class writing exercises, homework, and essays, the course will explore a variety of ways to craft an essay, take notes on reading material, and respond critically to the material one reads.
This course has two components. The first is learning about the variety of essays one may write for academic and professional purposes. Examples of these are writing from experience, writing to compare, and writing about issues. The second is identifying themes common among the various essays we read.

Learning Objectives

1. The ability to read significant texts carefully and critically, recognizing and responding to argumentative positions.
2. The ability to write sustained, coherent and persuasive arguments on significant issues that arise from the content at hand.
3. The ability to write clearly, following the conventions of Standard English

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
30

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

RNCU 102–Research Methods Seminar (2 credits)

Class Outline

This particular course is designed to function both as an introduction to questions of research and methodology as well as one which culminates in a seminar presentation of a particular topic. The course shall begin with an overview of what is research, why do research, what are the different kinds of research and then move on to specific exercises which will help you to answer questions like how do I find a topic, where do I find information on it, what do I do when I find it? Eventually one hopes that this course is able to bring us to a certain understanding of how one undertakes and brings to a successful fruition an academic research paper.

Learning Objectives

1. Understanding the questions of research
2. Introduction to different aspects of research such as, asking the right questions, framing the argument, listing sources, bibliography etc
3. Exposure to different sources of information and how to access them

Learning Strategy
Seminar based Enquiry

Contact Period (in hours)
30

Form of Evaluation
Term Paper

Method of Evaluation
Interpretative Evaluation by Internal and External Expert(s)

Distribution of Grades/Marks

INTERNAL			EXTERNAL
60 % (total marks assigned: 100)			40% (total marks assigned: 100)
Assessment 1 (Mid-term)	Continuous Assessment	Assessment 2 (End-term)	Assessment 2
Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: Internal Expert	Assessment levels: 1) External Expert
Total Marks Assigned: 20 out of 100	Total Marks Assigned: 50 out of 100	Total Marks Assigned: 30 out of 100	Total Marks Assigned: 100

MCMS 601- Media Studies (2 credits)

Class Outline

This module familiarizes the students with media as a means of communication and the role played for transforming the human society and civilization at its various stages. This class deals with the evolution and history of communication from various contexts such as historical, social, technological and business. The development of communication starting from signs & symbols, oral communication, print & electronics till the latest technologies used for communication, will also be discussed.

Learning Objective

1. To be expose to the historical evolution of communication and media.
2. Understanding of the media in various contexts such as historical, social, technological and business.
3. Perspective of the media as an industry in a globalize world.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCCC 601- Communication Concepts and Process (2 Credits)

Class Outline

This class will deal with the detailed understanding of principles, perception and interpretation of the communication process. Interpreting the process of mass communication through various schools of approaches such as Aristotelian, Gandhian, Liberatarian, Marxarian etc will be discussed. This will provide an insight into the prevailing mass media theories, dominant paradigms and its critiques.

Learning Objective

1. In depth understanding of the process of mass communication at broader level will be achieved.
2. An understanding of the mass communication process through various approaches.
3. Understanding of Theories of mass communication proposed by various people and its related discourses.
4. Insight towards various models of mass communication.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPH 601- Photography (2 Credits)

Class Outline

Photography is an art and science. This class will deal with teaching photography as means of visual communication. This class will introduce students to various scientific concepts related to photography like intricacies of optics and aesthetics, frames and shots, various other technical aspects of camera language. It will introduce students to various artistic endeavours. This class will also deal with properties of light and its creative use in the field of photography.

Learning Objective

1. To familiarize the students with the scientific and technological development related to camera, viz., from pin hole to digital.
2. To make the student proficient in understanding the various components, accessories, mechanism and operation of camera.
3. Understanding the interface between science and art for achieving different photographic goals.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPR 601- Print Production Project (8 Credits)

Class Outline

This class will deal with the skills, techniques and processes of print journalism. The processes and practices of print medium will be created in the class and the print media lab. Students will be familiarized with the different aspects of print journalism, viz., writing and reporting, editing, padding and packaging and final production.

Learning Objective

1. This class will inculcate a strong sense of news and ability to understand the news worthiness in different contexts, situations and areas.
2. Better understanding of organogram of a print media house.
3. To develop the ability and skill of writing, reporting and editing in different and varied styles.
4. To make them well versed in the process of print production.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
120

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCWM 601- Writing for Media (2 Credits)

Class Outline

This Class will deals with acquiring effective writing skills required for good writing for media. Class will also familiarize the students to various writing skills and styles for various media like radio, tv etc.

Learning Objective

1. To familiarize students with basic writing skills for different media
2. Varied and diverse styles of writing in practice for print media
3. Varied and diverse styles of writing in practice for broadcast media like Radio, TV etc.
4. This class will also enhance the writing skills for diverse media.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPR 602- Broadcast Media: Radio Production Project (8 Credits)

Class Outline

This class will deal with various elements, formats and creative presentation of radio programmes. Beginning with conceptualization of the radio programme, this deals with various stages of the production process keeping in view the nature of audience and the zone of broadcast.

Learning Objective

1. To familiarize the students with the medium of radio.
2. Understanding of creativity in audio medium.
3. Better understanding of technical and aesthetic of outdoor and studio based radio programme production.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
120

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCAU 602- Audiography (4 Credits)

Class Outline

This class will deals with the science, art and aesthetics of sound. This class will also introduce the perception of sound, recording, production, re-production of sound, acoustics, microphones and technique of sound editing and mixing.

Learning Objective

1. To familiarize with technical aspects of sound recording in a studio situation.
2. To familiarize different technical aspects of sound recording in outdoor.
3. To empower the students to use the technical know how to achieve the creative and aesthetic target.
4. Ability to make creative use of sound for various media.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCOM 602- Online Media (2 Credits)

Class Outline

This class will deal with characteristics, feature and scope of new media. Approaches of content presentation for different websites and social networking sites will be discussed in the class. This class will deals with convergence of ideas and technologies. This will strengthen the understanding of the concept of convergence and content development amongst various media.

Learning Objective

1. This class will help students to understand new media in totality.
2. To familiarize the phenomenon of convergence and online journalism.
3. Skill to use multiple media for an individual or collective expression.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPH 602- Advance Photography (2 Credits)

Class Outline

This class will all the professional aspects required to become a professional photographer. Photography like fashion, wildlife, news, architecture, developmental will be dealt practically. This class will enhance the technical ability to achieve the desires creativity in still photography.

Learning Objective

1. Develop a strong sense for visual language
2. Practical knowledge of using visuals for newspapers, magazines etc.
3. Develop creative and technical skills required for different formats of photography like fashion, wild life, news, architecture etc.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPR 701- Broadcast Media: TV Production Project (12 Credits)

Class Outline

This class will deals with knowing the numerous components required for a television production. The stages of production from conceptualization till the editing will be dealt with. This will include camera dynamics, creative use of lighting, understanding sets and props etc.

Learning Objective

1. Familiarize with different aspects of TV production such as pre-production, production and post- production.
2. Develop technical skills for indoor and outdoor situation.
3. Understanding of multicam production and working in PCR.
4. To enable to produce their television programmes of different genres.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
180

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCBP 701- Broadcast Production Skill (6 Credits)

Class Outline

This class will deals with the interpretation and perception of audio visual medium of TV. Different styles and techniques of post production will also be dealt with. The perception of sound, light, audio video recording in different modes like online and offline will be given.

Learning Objective

1. To build a perception of sound for television medium.
2. Familiarize with technical skills required for video editing.
3. Understanding of different techniques of audio video editing.
4. Familiarize with online and offline techniques of editing.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
90

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCML 701- Media Law & Ethics (1 Credit)

Class Outline

This class will deal with press laws and ethical issues, practices in media. Rules and laws for media organizations and the Regulatory bodies of the Press and Electronic media will be discussed in the class.

Learning Objective

1. Understanding of press laws and media ethics applied for media organizations and professionals
2. An insight about the self censorship, freedom of speech and expression.
3. Familiarize with cyber laws and current issues in legal terms.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
15

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCMM 701- Media Management (1 Credit)

Class Outline

This class will deals with the organizational structure, the hierarchy in organizations, media economics etc. Understanding of organogram of small and big organizations, organizational sanctity, media economics and group work will also be discuss in this class.

Learning Objective

1. To familiarize with media organization and its hierarchy.
2. To understand audience and the media economics.
3. Understanding of leadership ability and skill to work in a group.
4. Familiarize with successful presentation skill and managerial quality.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
15

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCDC 701- Development Communication (4 Credit)

Class Outline

This class will deals with effective and strategic interventions of media & communication in development processes. To understand the use and potential of both interpersonal and mass media in order to make effective communication interventions around issues pertinent to developing countries in general and India in particular.

Learning Objective

1. Understanding of development, development processes and policies.
2. Interface of development & communication
3. Familiarize with role of media for developed, developing and underdeveloped countries

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MCPR 702- Final Project (20 credits)

Class Outline

This deals with the practical training of the students wherein they will apply the knowledge of Print and electronic media, learnt earlier classes.

Learning objective

1. This class will enhance the students' practical applicability of theoretical knowledge.
2. This will concentrate in using Print, Radio, TV or online media in order to complete the project.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
180

Form of Evaluation:
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation:
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

Post Graduate Diploma of Advertising and Public Relations Curricula

Course and Credit Distribution

Term-I	Credit	Term-II	Credit
Principles of Communication	4	Advertising Law & Media Ethics	2
Advertising: Concept & Management	4	Advertising Production Techniques	4
PR Concept, Structure & Practices	4	Corporate Communication	2
Market Research	4	Any One	
Online Advertising	4	Client Servicing & Account Planning	4
Creative Writing	4	Media Planning & Buying	
		Media Marketing	
		Advertising Creativity	
		Project	12
Total	**24**		**24**

MDPC 401- Principles of Communication (4 Credits)

Class Outline

This class will deal with detailed understanding of principles, perception, techniques and interpretation of the communication process. This class will also deal with interpreting the processes of mass communication for a better understand of advertising, social marketing. This will also provide an insight into the prevailing mass media theories, dominant paradigms and its critiques.

Learning objective

1. In depth understanding of the process of mass communication at broader level will be achieved.
2. An understanding of the mass communication process and its interface with Advertising, social marketing and PR.
3. To enhance the understanding of Theories of mass communication proposed by various people and its related discourses.
4. To discuss insight towards various models of mass communication.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
60

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MADAC 401- Advertising: Concept and Management (4 credits)

Class Outline

This class will deal with advertising concepts, types and its classifications. The scope of learning includes Indian as well as global advertising scenario. The concept & function of advertising and advertising management will also be dealt with. The theories of advertising as well as management will be taught in this class.

Learning objective

1. To familiarize the students with the concepts of advertising.
2. In depth understanding of advertising management
3. Insight towards various models, functions and organogram of an ad agency.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
60

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDSP 401- PR Concept, Structure and Practices (4 Credits)

Class Outline

This class will deal with an in depth understanding of the concepts and principles related to Public Relations. This class will further deal not only with the evolution and various theories related to PR but also with the various writing skills needed in the field, making the students aware of laws and ethics in it. This will also make the students aware of the existence of PR in various sectors along with the knowledge of strategic PR management and handling crisis communication through it.

Learning objective

1. In depth understanding of various theories and principles of public relations.
2. To familiarize with interface of PR with management discipline.
3. To familiarize with PR in different sectors such as government and public sector, NGOs and Corporate sector.
4. To familiarize with different writing style and skills for public relations officer.
5. Develop the understanding of various concepts such as Public opinion, pressure group etc.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
60

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDMR 401- Media Research (4 Credits)

Class Outline

This class will deal with the scope and significance of media research in the field of advertising and PR. The various methods of research will also be dealt with. Emphasis would be given on advertising research, positioning research, target market research, pretest research and audience research

Learning objective

1. To understand the scope and importance of research in the field of advertising and PR.
2. To familiarize with various methods of research
3. In depth understanding of the practical and theoretical aspects of qualitative & quantitative research, field observation, ethnography, planning, implementation and evaluation, readership survey, audience measurement etc.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
60

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDOA 401- Online Advertising (4 Credits)

Class Outline

This class will deal with the concept of convergence media and online advertising. Concepts like understanding human communication models, art of targeting, respecting privacy will be dealt with. The techniques and tools of online advertising will be discussed in detail.

Learning objective

1. In depth understanding of the online advertising at a broader level will be achieved.
2. To familiarize with search engine optimization, online advertising servicing and management.
3. To familiarize with skills and ability for web analytics.
4. To familiarize with blogging and social networking sites.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDCW 401- Creative Writing (4 Credits)

Class Outline

This Class will deals with acquiring effective writing skills required for advertisement. This class will also familiarize the students to various writing skills and styles for various media like print, radio, TV and online. This class will introduce the students to various format and styles of writing.

Learning objective

1. To make the students well versed in creating a copy or the art of copy writing, well-targeted headlines as well as making a clear designs.
2. To understand the difference in writing and also create various advertisements from phone kiosks to large billboards and banners.
3. To inculcate varied and diverse styles of writing in practice for broadcast media like Radio, TV advertising etc.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
60

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDAL 402- Advertising Laws and Ethics (2 Credits)

Class Outline

This class will deal with laws and regulations related with media and advertising. It will deal self-regulation, MRTP, ASCI, AAAI, copyright act, International Intellectual Property Act, various regulatory bodies etc. Different ethical issues and controversies with advertising will also be dealt with. Deceptive and Unfair Practices, Consumer Forums and Social Criticisms of Advertising will be discussed.

Learning objective

1. An insight about the various laws and ethics of advertising like copyright act, self-censorship, freedom of speech and expression as well as cyber laws etc.
2. To familiarize the students with regulatory bodies and ethical issues with advertisement.
3. To make the students legally informed.
4. Understanding of Consumer Forums and criticism of advertisement.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDAP 402- Advertising Production Techniques (4 Credits)

Class Outline

This class deals with the conceptualization, ideation and related skills required to create and produce advertisement in various media. The understanding of the different approaches like psychological, emotional, fear arousal etc. of advertising will be discussed. Production skills, technique and style of advertisements for different media will be dealt with.

Learning objective

1. In depth understanding of creative use of space and time for an advertisement.
2. Build skills and ability for an innovative approach in advertising.
3. The students will be able to produce advertisements on their own.
4. Familiarize with strategy and planning for an advertising campaign.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

Internal			External
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDCC 402- Corporate Communication (4 Credits)

Class Outline

This class will deal with the principles and the concept of corporate communication as well as the evolution and growth of it. The relevance of corporate communication with the emerging market scenario will be addressed. The financial communication and financial media will be discussed. How the large social, political, economic and cultural climate in which corporations create their images and project themselves will be dealt with in this class.

Learning objective

1. To expose understand the creation of circumstances for the emergence of corporate communication.
2. To familiarize with financial communication and media.
3. To understand and capitalize on the psychology of corporates.
4. To use the best mix of communication channels like videoconferences, email, reports etc. for efficient corporate communication.
5. To understand the ethical dimension of corporate communication

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

Any one

MDCA 402- Client Servicing and Account Planning (4 Credits)

Class Outline

This class will deal with all-round understanding of client-agency relationship. Various components of client servicing, management and planning of client's account and their significance for both the parties will be discussed in detail.

Learning objective

1. In depth understanding of concepts such as unique selling point, positioning, space and time management etc.
2. Understanding of skills needed to approach prospective clients.
3. To build the ability and skills needed for an account planner.
4. In depth understanding of market oriented strategic planning skill.
5. To develop expertise in making advertising strategy.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
60

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDBP 402- Media Planning and Buying (4 Credits)

Class Outline

The subject of media planning and buying will provide an overview of audience stratification and classification of media. It will also deal with the concept of mix media frequency and periodicity of information. Budgeting will be another important component of media planning. The class will deal with the economics of time and space in different media and its judicious use.

Learning objective

1. Understanding towards building brand awareness using ATL & BTL will be achieved.
2. Clear understanding towards new trends in media buying will be achieved.
3. To familiarize with industry media interface, ATL & BTL and process of media planning.
4. To familiarize with media planning software like TAM, NRS & IRS.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDMM 402- Media Marketing (4 Credits)

Class Outline

This class introduces the students to the basic concept of media marketing. It helps in understanding the most valuable asset of the companies: consumers, their behaviour and the various models of buyer behaviour. It helps to understand the relevance of social marketing and also introduce the students to the concept of integrated marketing communication. This class will also deal with competitive marketing, competitive media market, monopoly, oligopoly market, time and space selling etc.

Learning objective

1. To familiarize with concept of media marketing and the business dimensions.
2. Understanding of consumer behaviour and buyer behaviour analysis etc.
3. In-depth understanding of social marketing and integrated marketing communication.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Term Paper/ Report, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDAC 402- Advertising Creativity (4 Credits)

Class Outline

This class will deal with different elements beginning from the concept level to final product. Different stages in creative writing, creative appeal, different styles of advertising, appreciation and presentation of some of the great and failed campaigns will also be discussed.

Learning objective

1. To familiarize with ability and skills needed to create advertisements.
2. Understanding of layouts designing keeping in mind the aesthetics of advertising.
3. In depth analysis of advertising campaign planning.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
60

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDPR 402- Final Project (12 Credits)

Class Outline

This class will assign practical projects to the students wherein they will apply the knowledge of Client Servicing, Account Planning, Media Planning and buying, Media Marketing and Creative Development etc., learnt in earlier classes. This assignment will be done individually and collectively.

Learning objective

1. This class will have to training students in ad agencies.
2. This will concentrate in using Client Servicing, Account Planning, Media Planning and buying, Media Marketing and Creative Development.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period
180

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: Internal Expert	Assessment level: External Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

Annexure-IX-D of Agenda Item no. 6.8

Post Graduate Diploma of Development Communication Curricula

Credit and Contact Period Distribution

Term-I	Credit	Term-II	Credit
Development, Concept and Approaches	2	Media for Development – II (Sound, Radio & Television Production)	8
Development Concerns and Issues	4	Media for Development – III (Theatre & Folk form, Media Campaign)	8
Development Planning	2	Project	6
Development Communication	2	Field Training	4
Communication Research & Evaluation	2		
Media for Development – I (Print Journalism, Documentation, A/V and Photo Journalism)	8		
Total	**20**		**26**

MDCS 401: Development, Concept and Approaches (2 Credits)

Class Outline

This class will deliberate the concept of development in a very holistic manner. It will deal with the various theories of economic development and human development. An important component of this call will be to see the state of poverty in its different forms and ideology. Characteristics of poverty its measurement and approaches to poverty reduction will be discussed in Indian context as well as third world.

Learning objective

1. To make them understand the concepts of underdevelopment and development
2. To develop the world view To – phenomenon of development and underdevelopment.
3. To understand the political economy of poverty in a historical perspective.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDCI 401: Development concerns and issues (4 Credits)

Class Outline

This class will discuss the contemporary social, political, economic and psychological issues pertaining which affect the human development at individual level and societal level. It will also look for various approaches and methods in practice to address them. This class will also examine the role of state, government, civil societies and international organisation

Learning objective

1. To make students not only aware of the contemporary issues but to sensitise them towards these as well.
2. To build the capacity of the students to examine the above issues critically.
3. To develop innovative methods of solving the above issues by themselves.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
40

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDDP 401: Development Planning (2 Credits)

Class Outline

This class deals with the art and science of planning. The necessity, scope and significance of planning required to build a society and develop it into a strong nation will be discussed. Development planning will be addressed in a historical view. The development and necessity of sectoral planning will be deliberated.

Learning objective

1. This class will develop the necessity of planning in relation to nation building.
2. This will also enhance the understanding of Indian state and its development giving an insight into the Five Year plans.
3. This will make the students come up with indigenous plans to develop the country.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation:
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDDC 401: Development Communication (2 Credits)

Class Outline

This class will discuss the phenomenon of development communication as a support system to the development process. The class will also critically examine various concepts, theories and models of communication propounded from time to time. Special emphasis will be given to alternative development communication approaches in third world and Latin America.

Learning objective

1. To familiarize the students to various theories and models related to communication.
2. To enhance the understanding of the students towards development communication.
3. An insight into the various approaches of development communication will be given.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDRE 401: Communication Research and Evaluation (2 Credits)

Class Outline

This class will deal with the scope and significance of media research in the field of communication. The various methods of research will also be dealt with.

Learning objective

1. To understand the scope and importance of research in the field of development communication.
2. To familiarize with various methods of research.
3. In depth understanding of the practical and theoretical aspects of qualitative & quantitative research, field observation, ethnography, planning, implementation and evaluation, readership survey, audience measurement etc.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
30

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDMP 401: Media for Development I- Print Journalism, Documentation, A/V and Photo Journalism (8 Credits)

Class Outline

The studio will deal with developmental print journalism, its related writing skills, styles and production out print. A/V and photojournalism workshop will make use of audio visual skills and techniques to produce A/V shows and photo features.

Learning objective

1. To make developmental stories news worthy.
2. To develop skills and techniques to produce developmental A/V shows and photo features one can capture the attention of audience.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
120

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDMD 402: Media for Development II- Sound, Radio and Television Production (8 Credits)

Class Outline

The studio and workshops will deal the various aspects of radio and TV production form ideation to final developmental projects. It will include the basics of sound recording, reproducing sound, camera work and its dynamics and finally the post production stage.

Learning objective

1. To enhance the ability to develop media production concepts especially radio and TV.
2. To familiarise with various technical aspects of production.
3. To understand the interface of technical aspects and content or subject matter.
4. To enable the students in giving interesting treatments to the production.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
120

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDMT 402: Media Development III – Theatre and folk form, Media Campaign (8 Credits)

Class Outline

The studio will deal with the scope and strength of traditional entertainment media, theatre and folk forms. This will discuss various technical and aesthetic aspects of theatre production – street theatre and proscenium.

Learning objective

1. The students will familiarised with the different forms of folk forma and tsreet plays and concept of proscenium.
2. To explore the possibility of a particular art form which can relate and bridge with particular audience.
3. To enable the students to translate issues and concerns of development into a media campaign by making use of these art forms.
4. To understand the developmental issues

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
120

Form of Evaluation
Term Paper/ Report

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDPR 402: Project (6 Credits)

Class Outline

This class will assign practical projects to the students wherein they will apply the knowledge of. This assignment will be done individually and collectively.

Learning objective

1. This class will have to training students in various organisations.
2. This will concentrate in using theoretical knowledge into practical skills.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
300

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

MDFT 402: Project Field Training (6 Credits)

Class Outline

The student has to choose a particular sector/and area related to the kind of development he/she is interested in.

Learning objective

1. To build professional working skills towards handling issues in organisations.
2. To come up with innovative ideas for solving issues.

Learning Strategy
Lectures/Enquiry based Seminar/ Atelier based collaborative learning

Contact Period (in hours)
300

Form of Evaluation
Desk Criticism based continuous evaluation, Jury Presentation

Method of Evaluation
Interpretative evaluation by Internal & external expert(s)

Distribution of Grades / Marks

INTERNAL			EXTERNAL
60% (Total marks assigned: 100)			40% (Total marks assigned:100)
Assessment-1 (Mid Term)	Continuous Assessment	Assessment-2 (End Term)	Assesment-2
Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: INTERNAL Expert	Assessment level: EXTERNAL Expert
Total marks assigned: 20 out of 100	Total marks assigned: 50 out of 100	Total marks assigned: 30 out of 100	Total marks assigned: 100

Annexure-X of Agenda Item no. 6.9

Bachelor of Computer Applications (BCA)International

Department of Computer Science & Engineering

03/03/2012
Sharda University
Academic Year 2011-2012

Contents

Bachelor of Computer Applications (BCA) International

INTRODUCTION

The Bachelor of Computer Applications (BCA) International is an application centric program. The program includes core and compulsory computer science courses that are prerequisites to support a large number of streams, or specializations. Currently, the program supports: Software Engineering, Animation, e-Commerce and e-Governance streams, courses for additional streams are under development.

The program emphasizes on hands-on practical training that equips students with such practical skills that is essential to demonstrate the professional excellence—thereby they have ample scope in computer supportive services. The program provides an excellent platform for preparing for career in

Vision

The program aspires for excellence in application-centric computer education and training.

Mission

- To empower students with specialized computer skills *through* imparting contemporary education, and providing training on domain specific application and development.

Goals

- To impart contemporary knowledge by periodic curriculum enhancement.
- To improve the application development skills by periodically upgrading laboratories and related resources timely.
- To train on contemporary domain-specific application development tools by periodic and timely stakeholders need assessment.

Program Duration

The program duration is three years: divided into six regular terms of 16 weeks each.

Credit requirements

In order to complete the program students are required to complete 140 credit hours.

Admission requirements

The aspirants of this program must have passed 10+2 examination with 50% or above mark. To obtain the degree students must:

1. Opt for a stream;
2. Complete successfully all the elective courses of the opted stream;
3. Conduct practical, seminars and industrial visits in opted stream or its related areas; and
4. Complete his/her project dissertation in the opted stream or its related areas.

Program Structure

Term: I

S. No.	Paper ID	Subject Code	Subjects	L	T	P	Credits
THEORY SUBJECTS							
1.			Basic English	3	0	0	3
2.			Discrete Mathematics	3	1	0	4
3.			Programming in C	3	1	0	4
4.			Digital Computer Fundamentals	3	1	0	4
5.			Professional Ethics & Responsibility	3	0	0	3
PRACTICALS							
1.			Programming in C	0	0	4	2
2.			Digital Computer Fundamentals	0	0	4	2
			Basic English Lab	0	0	4	2
						Total Credits	**24**

Total Contact Hours = 30

Term: II

S. No.	Paper ID	Subject Code	Subjects	L	T	P	Credits
THEORY SUBJECTS							
1.			Effective English	3	0	0	3
2.			Environmental Studies	3	0	0	3
3.			Computational Methods	3	1	0	4
4.			Introduction to Information Technology	3	1	0	4
5.			Object Oriented Programming with C++	3	1	0	4
PRACTICALS							
1.			Effective English	0	0	4	2
2.			Computational Methods	0	0	4	2
3.			Object Oriented Programming with C++	0	0	4	2
4.			Introduction to Information Technology Lab	0	0	4	2
						Total Credits	**26**

Total Contact Hours = 34

Term: III

S. No.	Paper ID	Subject Code	Subjects	L	T	P	Credits
THEORY SUBJECTS							
1.			Communicative English	3	0	0	3
2.			Computer Graphics	3	1	0	4
3.			System Analysis and Design	3	1	0	4
4.			Programming in JAVA	3	1	0	4
5.			Data Structures	3	1	0	4
PRACTICALS							
1.			Communicative English	0	0	4	2
2.			Programming in JAVA	0	0	4	2
3.			Data Structures	0	0	4	2
						Total Credits	**25**

Total Contact Hours = 31

Term: IV

S. No.	Paper ID	Subject Code	Subjects	L	T	P	Credits
THEORY SUBJECTS							
1.			Internet & its Applications	3	1	0	4
2.			Principles of Operating Systems	3	1	0	4
3.			Webpage Design & Computing	3	1	0	4
4.			Software Engineering	3	1	0	4
5.			Data Communication & Networking	3	1	0	4
PRACTICALS							
1.			Internet & its Applications	0	0	4	2
2.			Principles of Operating Systems	0	0	2	1
3.			Webpage Design & Computing	0	0	4	2
						Total Credits	**25**

Total Contact Hours = 30

Term: V

S. No.	Paper ID	Subject Code	Subjects	L	T	P	Credits
THEORY SUBJECTS							
1.			Database Systems	3	1	0	4
2.			Elective-1	3	0	0	3
3.			Elective -2	3	0	0	3
4.			Free Elective	3	1	0	4
PRACTICALS							
1.			Lab: Database Systems	0	0	2	1
2.			Lab: Elective-1	0	0	4	2
3.			Lab: Elective-2	0	0	4	2
4.			Capstone Project- I	0	0	6	3
						Total Credits	**22**

Total Contact Hours = 30

Term: VI

S. No.	Paper ID	Subject Code	Subjects	L	T	P	Credits
THEORY SUBJECTS							
1.			Elective-3	3	0	0	3
2.			Elective-4	3	0	0	3
PRACTICALS							
1.			Lab: Elective-3	0	0	4	2
2.			Lab: Elective-4	0	0	4	2
			Capstone Project II	0	0	16	8
						Total Credits	**18**

Total Number of Credits = 140

Total Contact Hours = 30

Total Contact Hours = 185

Total lab. hours = 90 (48.65%)

***All electives 1, 2, 3, & 4 must belong to the opted specialization.**

Specializations

Computer Animation, Software Engineering, E-Commerce and E-Governance

Specializations	Courses			
	I	II	III	IV
Animation	Fine Arts & Digital Media	Multimedia & Virtual Reality	Computer Animation	Animation & Digital Cinema Production
Software Engineering	Human Computer Interaction	Object Oriented Software Design	Software Project Management	Software Economy & Trade
E-Commerce	Human Computer Interaction	Fundamentals of E-Commerce	Web Technologies foe E-Commerce	Enterprise Resource Planning
E-Governance	Human Computer Interaction	Fundamentals of E-Commerce	Cyber Laws	E-Governance Case-Studies

Course Description

Discrete Structure (Term I)

L-T-P (3-1-0)

UNIT I: **Set Theory:** Definition of sets. **Relation:** Definition, types of relation, composition of relations, Pictorial representation of relation, equivalence relation. **Function:** Definition, type of functions, one to one, into and onto function, inverse function, composition of functions, recursively defined functions.

UNIT II: **Boolean Algebra:** Basic definitions, sum of products and product of sums, form in Boolean Algebra, Logic gates and Karnaugh maps.

UNIT III: **Propositional Logic:** Proposition, First order logic, Basic logical operation, truth tables, tautologies, Contradictions, Algebra of Proposition, logical implications, logical equivalence.

UNIT IV: **Graphs Theory:** Simple graph, multigraph, graph terminology, representation of graphs, Bipartite, Regular, Planar and connected graphs, connected components in a graph, Euler graphs, Hamiltonian path and circuits, Graph coloring, chromatic number, isomorphism and Homomorphism of graphs.

UNIT V: **Tree:** Definition, Rooted tree, properties of trees, binary search tree, tree traversal.

Text books:

1. Liptschutz, Seymour, *Discrete Mathematics*, McGraw Hill.

Refernce books:

1. Trembley, J.P & R. Manohar, *Discrete Mathematical Structure with Application toComputer Science*, McGraw Hill.

2. Kenneth H. Rosen, *Discrete Mathematics and its applications*, McGraw Hill.

3. Deo, Narsingh, *Graph Theory with application to Engineering and Computer Science*, PHI.

Programming in C (Term I)

L-T-P (3-1-0)

UNIT I: Introduction, C is usually first – What is the ANSI-C Standard, Getting Started C Tokens- Identifiers, Keywords, constants, Data types- A word About Compilers 1.3 Getting Started in C, Your First C Program - A Program that does something – Printing in C –
Comments in C – Formatting Style

UNIT II: Program Control, The **while** loop, **do-while** loop, **for** loop, **if** Statement, **if-else** statement, **break** and **continue**, **switch** statement, **goto** statement Assignment & Logical Compares, Integer Assignment Statements - Data types - Data Type modifiers - Variable Types, Type Conversion (Implicit and Explicit) Operators , Types of operators, operands, The conditional Expression.

UNIT III: Functions and Prototypes, User defined Function - Defining the Functions - Passing a value to a Function - Floating Point Functions, The return type of **main()** - Scope of variables – Global Variables and Static, Variables

UNIT IV: The C Preprocessor, Enumerated Data type, Strings and Arrays: What is a String? - What is an Array? - Using the String - Printing a String – Some String Functions, Array of Integers, Two dimensional Arrays- Multi-Dimensional Arrays, Pointers: What is a Pointer? - How do you define a Pointer? - Pointer Indexing – Pointer arithmetic

UNIT V: File Input / Output, Output to a File - Opening a File - Reading ("r"), Writing ("w"), Appending ("a"), Outputting to the File - Closing a File, Outputting a Single Character at a Time - The **putc()** Function - Reading a File Structures and Unions, What is a Structure? - A Single Compound Variable - Assigning values to the Variables, Unions

Text Books:

1. Reema Thareja, *Programming in C*, Oxford publications.

Refernce Books

1. E. Balagurusamy, *Programming in ANSI C*, Tata-McGraw-Hill.

2. B. W. Kernighan & D. M. Ritchie, *The C Programming Language*, PHI.

Digital Computer Fundamentals (Term I)

L-T-P (3-1-0)

UNIT I: Number systems: Data representation - binary, octal, decimal, hexadecimal, conversion from one to another number system. Representation of positive, negative numbers, integers, real, and characters, digital codes: BCD, ASCII, EBCDIC coding, binary arithmetic in 1's and 2's complement.

UNIT II: Boolean Algebra: Logic gates, truth table, logic expression, rules and laws of Boolean algebra, De Morgan's theorems, Boolean expression for gate networks, simplification of Boolean expression using Karnaugh map (up to 4 variables).

UNIT III: Flip Flops: Latches, edge-triggered flip flop, pulse triggered flip flop, R-S flip flop, JK Master-slave flip flop, D flip flop, T flip flop. Shift Registers: Shift registers function, serial and parallel shift registers, bi-directional shift registers.

UNIT IV: Counters: Asynchronous and synchronous counters, up/down counters, modulo-n counters, BCD counters, and a procedure for design of sequential circuit.

UNIT V: Combinational circuits: Adder, Subtractor, comparator, decoder, encoder, code conversion, multiplexer, Demultiplexer, parity bit checker and generators.

Text Books:

1. Malvino and Leach, Digital principles and applications, Tata McGraw-Hill.

Reference Books

1. Thomas L Floyd, *Digital fundamentals*, United Book Stall, New Delhi.
2. Rajaraman V. and T. Radhakrishanan, *An introduction to digital computer design*, PHI.
3. M. M. Mano, *Digital logic and computer design*, PHI.

Computational Methods (Term II)

L-T-P (3-1-0)

UNIT I: Computer Arithmetic and Solution of Non-Linear Equations : Introduction - Floating Point Arithmetic and Errors: Floating point represent of Numbers - Sources of Errors - Non-Associativity of Arithmetic - Propagated Errors - Pitfalls in Computation.

UNIT II: Solution of Non-Linear equations: Bisection - Fixed point - Regula falsi - Newton's Raphson - Secant method. Convergence criteria of Iterative methods.

UNIT III Solution of simultaneous Linear Algebraic Equations and ordinary differential equations : Cramer's Rule - Gauss elimination method - Pivoting Strategies - Gauss Jordan method - Jacobi Iterative method - Gauss Seidal method -Comparison of Direct and Iterative methods.

UNIT IV: Interpolation and Curve Fitting: Problem of Interpolation - Lagrange's method of Interpolation - Newton's interpolation formulae - Error of the Interpolating Polynomial - Interpolation at equally spaced points.

UNIT V: Numerical differentiation and Integration : Differentiation based on polynomial fit - Numerical integration using Simpson's rule and Gaussian quadratic formula - Numerical solution of differential equations of the form dy/dx=f(x, y) using Euler's method methods.

Text Book (s):

1. V. Rajaraman, *Computer Oriented Numerical Methods*, PHI.

2. B.S. Grewal, *Numerical Methods for Engineering*, Sultan Chand.

Introduction to Information Technology (Term II)

L-T-P (3-1-0)

UNIT I: **Concept of computers-** Evolution of computers and their classification. Computer applications, Introduction to computer memory-RAM, ROM, Secondary Storage and devices. Introduction to input and output devices.

UNIT II: **Information Technology Basics-** Introduction – information, technology and information technology. Role of information technology. Introduction to Multimedia and multimedia system and applications. Office Automation Concepts-MS Office Tools. Types of Information Systems- Manual Information System, Computer Based Information System.

UNIT III: **Introduction to Computer Software-** categories of software, software piracy and terminologies. Types of software. Overview of Languages- Low level and high level languages, Assemblers, compilers, interpreters.

UNIT IV: **Introduction to Networks & Internet-** Concepts of LAN/WAN/MAN, Communication Channels, Network Topologies, History & Evaluation of Internet, Intranet Concept, Internet Service Provider (ISP), Types of Internet Connections. Modems, Routers, Switches, TCP/IP, OSI Model, Web server and web browser, Internet Domain, IP Address, Uniform Resource Locator (URL), Search Engines.

UNIT V: **Emerging Trends in IT-** Introduction- E-Commerce, Electronic Data Interchange (EDI), Mobile Communication, Bluetooth, Global Positioning System (GPS), Infrared communication, smart card, Imminent Technologies.

Text Book:

1. ITL Education Solutions Limited, *Introduction to Information Technology*, Pearson Education.

Reference Books

1. V. Raja Raman, *Introduction to Computers*, PHI.

2. Alex Leon & Mathews Leon, *Fundamentals of Information Technology*, Leon Pub.

Object Oriented Programming (Term II)

L-T-P (3-1-0)

UNIT I: **Object oriented paradigm.** Evolution of programming paradigm, structured versus object-oriented development, elements of object-oriented programming, objects, classes. *Introduction to C++*: Introduction, hello world, single line comment, literals – constant qualifiers, scope resolution operator (::), reference variables, parameters passing by reference, inline function, function overloading.

UNIT II: **Classes and objects.** Introduction, class specification, class objects, accessing class members, defining member functions, outside member functions as inline, accessing member functions within a class, data hiding, passing objects as arguments, friend functions and friend classes, constant parameters and member functions, structures and classes, static data and member functions, class. *Operator overloading:* Introduction, over loadable operators, unary operator overloading, operator keyword, operator return values, limitations of increment/decrement operators, binary operator overloading, arithmetic operators, assignment operator overloading,.

UNIT III: **Inheritance.** Introduction, class revised, derived class declaration, forms of inheritance, inheritance and member accessibility, constructors in derived classes, destructors in derived classes, constructors invocation and data members initialization, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance.

UNIT IV: **Virtual functions:** Introduction, need for virtual functions, pointer to derived class objects, definition of virtual functions, array of pointers to base class objects, pure virtual functions, abstract classes, virtual destructors.

UNIT V: **Exception handling:** Introduction, error handling, exception handling model, exception handling constructs, handler throwing the same exception again, list of exceptions, catch all exceptions, exceptions in constructors and destructors, handling uncaught exceptions, exceptions in operator overloaded functions, exception in inheritance tree.

Text Book(s)

1. Budd T A, *Object Oriented Programming*, Addison Wesley.

Reference Book(s):

1. E. Balagurusamy, *Object oriented programming with C++*, Tata McGraw Hill.

2. Robert Lafore, *Object Oriented Programming in C++*, SAMS Publishing.

Computer Graphics (Term III)

L-T-P (3-1-0)

UNIT I: What is Graphics, Application of Graphics, Elements of Graphics, Workstation, Graphics I/P Devices-Keyboard, Trackball, Joystick, Light Pen, Digitizing Tables, Mouse, Touch Panels, Image Scanners .Graphics Display Devices-Raster Scan System, Random Scan System, Arch Of Vector and Raster Scan Display, Refresh CRT.

UNIT II: DRAWING GEOMETRY: Point – Plotting, Coordinate System, Point, Plotting, Line Drawing –Line Segments, Line Drawing Algorithm: DDA Algorithm, Bresenham's Line Algorithm. Circle Drawing Polygon Representation

UNIT III: Ellipse, Rectangle, Filling – Filled Area Primitives, Scan Line Polygon Fill Algo, Flood Fill Algorithm, Boundary Fill Algorithm.

UNIT IV: 2D Geometric Transformation : Translation, Rotation, Scaling, Geometric Transformation, Coordinate Transform and Composite Transformation, 2D Viewing Transformation & Clipping : World Coordinate System (WCS), Normalized Device Coordinate System ,Windows Viewing View Ports Viewing, Point Clipping, Line Segment Clipping, Coahen – Sutherland, Line Clipping , Polygon Clipping.

UNIT V: Geometric Transformation 3D Geometric Transformation: Translation, Rotation, Scaling, Coordinate Transform Geometric Transformation Composite Transformation, 3D Display Methods –Parallel Projection Perspective Projection 3D Viewing &Clipping. Hidden Surface, Z – Buffer Algorithm, Scan Line Algorithm, Painters Algorithm.

Text Books

1. D. Hearn and M. P. Baker, *Computer Graphics*, PHI.
2. W. M. Newman and R. F. Sproull, *Principles of Interactive Computer Graphics*, McGraw Hill.

System Analysis & Design (Term III)

L-T-P (3-1-0)

Unit I: Fundamental of System Development: System concept-characteristics-elements of system, types of system, modern approach to system analysis and design, system development life cycle, approaches to improve the system development, tools for system development, role of system analyst.

Unit II: System Analysis: Determining system requirements, traditional methods, modern methods, structuring system requirements, process modeling, data flow diagram, logic modeling-conceptual data modeling, E-R modeling.

Unit III: System Design: The Process and Stages of System Design, Design Methodologies, Development Activities. Input Design, Output Design, Types of Forms, Basics of Form Design.

Unit IV: Implementation: System implementation, software application testing installation documentation, training and support, organizational issues in system implementation.

Unit V: Maintenance: maintaining information system, types of maintenance, conducting system maintenance

Text Books:

1. Elias M. Awad, *System Analysis & Design*, Galgotia Publications.

Reference Books:

1. Jefferey A Hoffer, *Moderen System Analysis & Design*, Pearson Education.

Programming in Java (Term III)

L-T-P (3-1-0)

Unit I: Introduction to Java : Object Oriented Concepts, Features of Java, Byte code, Java Virtual machine, JDK and its components, Difference between C, C++ and Java, Command Line argument, Constant, Symbolic Constants, variables, Scope of Variables, Data Types, Type Casting. Operator: Arithmetic, relational, logical, increment, decrement, bit wise, conditional, Expression.

Unit II: Control Statement (if-else, else if, switch), Looping (while, do, for, Jumps in Loops). Defining a Class, Fields Declaration, Methods Declaration, Creating Objects, Accessing class members, Constructors, Methods Overloading, Static Members, final variable and methods, abstract methods and class. Array, String, Wrapper Classes

Unit III: Inheritance: Defining Inheritance, inheritance using class, inheritance using interface, Overriding Methods, Final Variables and Methods, Final Classes, Finalize Methods. Access Specifiers: public, protected, private, default. Modifiers: final, abstract, static, synchronized, native, volatile, transient. Interfaces: Defining Interface, Extending Interface, Implementing Interface, Accessing Interface Variable.

Unit IV: Packages: Java API Packages, Using system Packages, Naming Conventions, Creating Packages, Accessing a Package, Using a Package, Adding a Class to a Package. Multithreading : Thread, Java Thread Model, Implementing threads in two ways - Thread class and Runnable interface, Various thread methods, Thread Life Cycle (thread states – running, ready, dead, waiting, sleeping, suspended, blocked), Thread priorities.

Unit V: Error and Exception Handling: Types of Errors, Exception, Types of exception, exception handling using try, catch, finally, throw, throws, multiple Catch Statement, Throwing our own Exceptions. Arrays, Creating an Array, One-dimensional Arrays, Two dimensional Arrays, Strings, Wrapper Classes.

Text Book:

1. H. Schildt, *The complete Java 2 reference*, Tata McGraw-Hill.

Reference Book(s):

1. E. Balaguruswamy, *Programming with Java, A primer*, Tata McGraw-Hill.

2. Deitel & Deitel, *Java™: How to Program*, PHI.

Data Structures (Term III)

L-T-P (3-1-0)

UNIT I: **Introduction to Data Structures:** Basic concepts and notations, data structures and data structure operations. Examples and real life applications.

UNIT II: **Linked List:** Linear list, representation, string operation, traversal, searching, Insertion in linear list, deletion of linked list, Header Lists, Circular Lists, insertion in a circular List, Deletion in a circular Linear List.

UNIT III: **Stack and Queues:** Stacks Representation in memory, Static implementation of stacks, Push operation, Pop operation, Examples and real life applications. Introduction of Queues, representation in memory, insertion in Queue, Deletion in queue. Examples and real life applications.

UNIT IV: **Trees and Graphs:** Trees-definitions and basic concepts, representation in memory, Tree traversal using stack, Binary trees, binary tree traversal, searching, insertion and deletion in binary trees, Binary Search Tree, Introduction to graphs, Traversing a graph , Representation and terminology of graphs, Adjacency matrix, path matrix implementation, Graph Traversal, Connectivity of graphs, Application of Graphs.

UNIT V: **Sorting and Searching:** Introduction, Search Techniques, Insertion sort and Bubble sort, Merging & Merge Sort, Selection sort, Quick sort.

Text Book(s):

1. Seymour Lipschutz, *Data Structures with C*, Tata McGraw Hill.

Reference Books(s):

1. Mark Allen Weises, *Data Structures & Algorithmic Analysis in C*, Pearson Education.
2. Tenenbaum et al, *Data Structures using C*, PHI.
3. Robert Kruse, *Data Structures and Program Design in C*, PHI.
4. Aho et al, *Data Structures and Algorithms*, Addison-Wesley.

Internet and its Applications (Term IV)

L-T-P (3-1-0)

UNIT I: **Introduction:** About internet and its working, business use of internet, services offered by internet, evaluation of internet, internet service provider (ISP), windows environment for dial up networking (connecting to internet), audio on internet, internet addressing (DNS) and IP addresses).

UNIT II: **E–Mail Basic Introduction:** Advantage and disadvantage, structure of an e–mail message, working of e–mail (sending and receiving messages), managing e–mail (creating new folder, deleting messages, forwarding messages, filtering messages) Implementation of outlook express.

UNIT III: **Internet Protocol:** Introduction, file transfer protocol (FTP), Gopher, Telnet, other protocols like HTTP and TCPIP.

UNIT IV: **WWW:** Introduction, working of WWW, Web browsing (opening, viewing, saving and printing a web page and bookmark), web designing using HTML, DHTML with programming techniques.

UNIT V: Search Engine: About search engine, component of search engine, working of search engine, difference between search engine and web directory.

Text book

1. H. M. Deitel, P.J. Deitel and A. B. Goldberg, *Internet and World Wide Web*, PHI.

Reference Book

1. Harley Hahn, *The Internet - Complete Reference*, Tata McGraw Hill.

Principle of Operating Systems (Term IV)

L-T-P (3-1-0)

UNIT I: **Introduction:** Concept of Operating System, Types of operating system- Simple batch systems, Multi-programmed Batch Systems, Time-Sharing Systems, Distributed Systems, Real-Time Systems. **Operating System Structure:** System Components, System Structure, Operating System Services.

UNIT II: Process Concept: Process & Process State, Process Control Block, Schedulers.
CPU Scheduling: Introduction of scheduling, types of scheduling: FCFS, Shortest Job First (JSF), Priority based scheduling, Round Robin scheduling.

UNIT III: Deadlock: Definition, Methods of Handling Deadlocks, Deadlocks Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

UNIT IV: Memory Management: Bare Machine Approach, Resident Monitor, Partition, Paging and Segmentation, Virtual Memory and Demand Paging, Paged Replacement Algorithm.

UNIT V: **File System:** Access methods, allocation methods, Directory system and file protection.

Text Books:

1. Milenekovie, *Operating System Concept*, McGraw-Hill.
2. A. Silveschatz, Peterson J, *Operating System Concepts*, Willey.

Reference Books:

1. W. Stalling, *Operating Systems*, Maxwell Macmillan.
2. Dietel & Deitel, *An Introduction to Operating System*, Addision Wesley.
3. Petersons, *Operating System Concepts*, Addision Wesley.
4. Tannenbaum, *Operating System Design and Implementation*, PHI

Web Page Design and Computing (Term IV)

L-T-P (3-1-0)

UNIT I: Introduction and Web Development Strategies. History of Web, Protocols governing Web, Creating Websites for individual and Corporate World, Cyber Laws, Web Applications, Writing Web Projects, Identification of Objects, Target Users, Web Team, Planning and Process Development.

UNIT II: HTML, XML and Scripting List, Tables, Images, Forms, Frames, Document type definition, Object Models. Introduction to Java Script, Object in Java Script, Dynamic HTML

UNIT III: Web Servers: Introduction to Servelets, Lifecycle, JSDK, Servlet API, Servlet Packages: HTTP package, Security Issues.

UNIT IV: JSP: Introduction to JSP, JSP processing, JSP Application Design, Tomcat Server, Implicit JSP objects, Conditional Processing, Declaring variables and methods, Error Handling and Debugging, Sharing data between JSP pages- Sharing Session and Application Data.

UNIT V: Database Connectivity: Database Programming using JDBC, Studying Javax.sql.*package, accessing a database from a JSP page, Application-specific Database Action, Developing Java Beans in a JSP page.

Text Books

1. J. Burdman, *Collaborative Web Development*, Addison Wesley.
2. Chris Bates, *Web Programming Building Internet Applications*, Wiley.

Software Engineering (Term IV)

L-T-P (3-1-0)

UNIT I: **Introduction to Software Engineering Process** Software engineering overview: Definitions of software Engineering, Software characteristics, Software components, Evolution of software engineering, Significance of software engineering, Challenges in Software Engineering. Software development methodologies: Water fall, Prototyping, Iterative & Incremental Development, Spiral Development.

UNIT II: **Software Requirements & Design Techniques** Software requirements: Functional and non-functional requirements, requirement gathering techniques: Interviews, Questionnaires, And Surveys. Requirements validation and verification, Software Requirements Specification (SRS) Document, IEEE Standards for SRS. Concept of Software Design, Data Flow Diagrams, Entity Relationship Diagrams, Flow Charts.

UNIT III: **Software Programming & Modeling Languages** Software Programming Language Overview: Classification of programming languages, Choice of programming language. Unified Modeling Language (UML) overview: State Diagram, Use-Case Diagram, Class Diagram, and Sequence Diagram.

UNIT IV: **Software Testing and Quality** Software Testing Philosophies: Black-Box Testing, White-Box Testing: Functional Testing. User Acceptance Testing, Regression Testing, Alpha & Beta Testing, Unit Testing, Integration Testing – Top-down Integration Testing, Bottom-up testing, performance testing.

UNIT V: **Software Projects and Emerging Trends in Software Engineering** Introduction to Software project Management and Emerging Trends in Software Engineering. Web technology in software development, Enterprise-Oriented Software Engineering, Global Software Development, Open Source Software Development, Future of Software Development.

Text Books:

1. R. S. Pressman, *Software Engineering: A Practitioners Approach*, McGraw Hill.

Reference Books:

1. Craig Larman, *Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development*, Prentice Hall.

Data Communication & Networking (Term IV)

L-T-P (3-1-0)

UNIT I: **Introduction:** Principles of data communications - Analog and digital transmission, multiplexing, transmission impairments, concepts of frequency spectrum and bandwidth, bandwidth efficient modulation techniques.

UNIT II: **Basics of computer networks:** Protocol hierarchies, design issues for the layers, interfaces and services. Concepts of circuit switching and packet switching, connection-oriented and connectionless services. Reference models-OSI model and TCP/IP reference model.
Physical layer**:** Transmission media-twisted pair, coaxial cable, optical fibre. Wireless transmission

UNIT III: **Data link layer:** Services provided to the network layer, framing, error control, flow control, Error detection and correction. Unrestricted simplex protocol, stop-and wait Protocol, sliding window protocols.

UNIT IV: **Media access control protocols:** Concept of LANs and MANs. ALOHA, slotted ALOHA, CSMA, CSMA/CD, Ethernet, token bus, token ring. **Network layer:** Design issues. Routing algorithms, Congestion control.

UNIT V: **Transport layer**: Services provided to the upper layers. Elements of transport control protocols-addressing, establishing a connection, releasing a connection, flow control and buffering, crash recovery. Example of simple protocols of transport layer.

Text Book

1. A. S. Tanenbaum, *Computer Networks*, PHI.

2. William Stallings, *Data and Computer Communications*, PHI.

Database Systems (Term V)

L-T-P (3-1-0)

UNIT I: **Introduction:** Purpose of Database system, Characteristics of database approach, Advantages of using DBMS, Database concept and architecture, Data Abstraction, Data Models, Instances and schema, Data independence, 3-schema architecture, Database Languages, Database Manager, Database Administrator, Database Users.

UNIT II: **Data Modeling:** Entity sets attributes and keys, Relationships (ER), Database modeling using entity, Type role and structural constraints, Weak and Strong entity types, Entity-Relationship Diagram, Design of an E-R Database schema.

UNIT III: **Relational Model:** Relational model-basic concepts, Relations, Domains, Attributes, Tuple, and Concepts of Keys: Candidate key, Primary Key, Alternate Key, Super Key, Foreign Key, Fundamental integrity rules: Entity integrity, Referential integrity, Codd's Rules.

UNIT IV: **Normalization:** Database design process, Relational database design, Relation Schema Anomalies in a database, Functional dependencies, Normal forms, First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form, Multivalued dependencies, Fourth Normal Form, Join dependencies, Fifth Normal Form.

UNIT V: **Query Language:** Introduction to SQL, Basic queries in SQL, Advanced queries in SQL, Functions in SQL, Basic data retrieval, Aggregation, Categorization, Updates in SQLs.

Text Book(s):

1. Korth , Silberschatz & Sudarshan, *Database Concepts*, Tata McGraw-Hill.
2. Elmasri, Navathe, *Fundamentals of Database Systems*, Pearson Education.

Reference Book(s):

1. Date C.J., *An Introduction to Database Systems*, Addison Wesley.
2. Ramakrishna, Gehkre, *Database Management System*s, Tata McGraw-Hill.

ELECTIVE I: Fine Art & Digital Media (Term V)

L-T-P (3-1-0)

UNIT I: **Orientation Module** History of animation, Collect movie names and studios, 9 old men of Disney, Collect disney character model sheets, Movie study, Movie plot, synopsis, character study, Behind the scenes Importance of 2D, Submit 2D production pipeline chart, Reference vs. design.

UNIT II: **Human & Animal Anatomy.** Head construction - male & female (front, side, 3/4th), 5 different male/female heads, body construction - male and female (front, side, 3/4th), 5 different male/female body constructions, age and body volumes, 5 different age group body constructions, hands and feet, 5 hands/feet angles, facial features and expressions, 10 different expressions chart using self snap/mirror, Creating dynamic poses - line of action, 20 line of action sketches from photographs, animal body constructions - dog, cat, deer (front, side, 3/4th), animal body constructions - dog, cat deer (front, side, 3/4th), animal poses.

UNIT III: **2D Production Pipeline.** Creating & developing a story and script - brainstorming, references, Painting concept art using Photoshop, Submit 5 original characters, BG & Matte Painting, Submit 2 different bgs in night and day lighting, 1 concept bg, Submit story/script and character description for the final project Designing animation characters & posing them, Finalise the project model sheet, final bg for project, Using camera angles, shots and scripts, Creating layouts and staging, Batman script staging - 6 minimum panels, Creating animation storyboard, Submit final project storyboard Leica reel explanation, Scrapbook of references. Nature study, script writing/dramatics, Storytelling workshop, Scrapbook.

Text Books:

1. Uwe Steinmueller, Juergen Gulbins, *Fine Art Printing for Photographers*, O'Relly.
2. Glen Creeber & Royston Martin, *Digital Culture: Understanding New Media*, Mc-Graw Hill.
3. Dariush Derakhshani, *Introduction to Maya 2008: Foundation*, Sybex Publications
4. Alias, *Learning Maya 7: The Modeling and Animation Handbook*, Wiley.

ELECTIVE I: Human Computer Interaction (Term V)

L-T-P (3-1-0)

UNIT I: Foundations of human-computer interaction: Human-centered development and evaluation, Human performance models, accommodating human diversity, Principles of good design and good designers, engineering tradeoffs.

UNIT II: Human-centered software evaluation: Evaluation without users: walkthroughs, KLM, guidelines, and standards, Evaluation with users: usability testing, interviews, survey, experiment

UNIT III: Human-centered software development: Approaches, characteristics, and overview of process, Functionality and usability: task analysis, interviews, surveys, Specifying interaction and presentation, Prototyping techniques and tools

UNIT IV: Graphical user-interface design: Choosing interaction styles and interaction techniques, HCI aspects of common widgets and screen design: layout, color, fonts, labeling, Handling human failure, Beyond simple screen design: visualization, representation, metaphor, Multi-modal interaction: graphics, sound and haptics, 3D interaction and virtual reality

UNIT V: HCI aspects of multimedia systems: Categorization and architectures of information: hierarchies, hypermedia, Information retrieval and human performance (Web search, Usability of database query languages, Graphics, Sound).

Text Books

1. A. G. Sudifte, *Human Computer Interface Design*, Macmillan Publishers.

2. B. Sheiderman, *Designing the user interface - Strategies for Effective Human Computer Interaction*, Addison Wesley.

ELECTIVE II: Multimedia & Virtual Reality (Term V)

L-T-P (3-1-0)

UNIT I: **Multimedia & Virtual Reality.** Using timeline – x-sheet, Timing and spacing – slow in slow out, reverse, Rolling back ball with x-sheet, Arc principle – Pendulum, head turn, Stretch & squash, Bouncing balls rubber and iron Wave principle, Grass, flag, water waves, Follow through & overlapping – secondary action Feather, dog ears, cloth, antenna (flash), Anticipation and accent, Make breakdowns for the anticipation exercise with tweens, Exaggeration, Make exaggeration poses for the given exercise with tweens, Rape and cloth animation, Make breakdowns for the anticipation exercise with tweens, Path of action, Balloon, feather Anticipation and walking workshop, Acting for animation

UNIT II: **Advanced Animation Techniques.** Walk cycles – run cycle animation, 3 walks of a simplified character, run cycle – fat and skinny Perspective walk, Assignment in perspective walk, Jump, Fat and skinny stationery jump animation, Weight lifting, Heavy and light weight animation, Quadruped walk and run, Deer, Opening door, Make breakdowns for the anticipation exercise with tweens , Animating expressions, Talking head sequence with expressions (Hello! How are you), Different styles of animation 3 different styles, Creating pokemon style animation, Create weather effects , Fire, rain ripples, smoke, splash, blast, speed lines, Leica reel – animatics**,** Cutout animation, stop motion animation, Creating animation for web, video, mobile, Robotic walk competition

Text Books:

1. N. Sarris & M. G. Strintzis, *3D modeling and Animation: Synthesis and Analysis for Human Body*, IRM Press.
2. Andy Harris, *Stair steps to Virtual Reality*, Indiana University - Purdue University, Indianapolis.
3. Rikk Carey & Gavin Bell, *The Annotated VRML 2.0 Reference Manual***,** Addison Wesley

ELECTIVE II: Object Oriented Software Design (Term V)

L-T-P (3-1-0)

UNIT I: **Introduction**: Object- Oriented, Object -Oriented Development, Object-Oriented Themes,Usefulness of Object -Oriented Development. **Modeling Concepts**: Modeling as a design technique, Object modeling: Object &Class, Link &Association, Generalization & Inheritance, Aggregation, Abstract Class, Multiple Inheritance, Dynamic Modeling, Functional Modeling.

UNIT II: **Design Methodology**: Methodology Preview: OMT as a Software Engineering Methodology,OMT Methodology , Impact of Object-oriented approach, Analysis, System Design, Object Design.

UNIT III: **Implementation**: Implementation using a programming Language, Implementation using a database, Implementation outside a Computer, Programming Style, Object-oriented Languages, Non-object oriented languages, Relational databases.

UNIT IV: **Application:** Object Diagram Compiler, Computer Animation, Electrical Distribution Design System.

Text Book:

1. Rumbaugh, M. Blaha, W. Premerlani, F. Eddy, W. Lorensen, *Object -Oriented Modeling and Design*, PHI.

ELECTIVE II: Fundamentals of E-Commerce (Term V)

L-T-P (3-1-0)

UNIT I: **Introduction & Network Infrastructure of e-Commerce-** Framework, Architecture, Benefits and Impact of e-Commerce, The Anatomy of e-Commerce applications, e-Commerce Consumer applications, e-Commerce Organization Applications, Prospects of e-Commerce. Intranet, Extranet, Internet, Internet Backbone, ISP and services in India, OSI Model, Standards & Overview of TCP/IP, Internet Security, e-Commerce & the Internet.

UNIT II: **E-commerce Models, e-Advertising & Marketing -** Business-to-Business-Hubs, Market Places, Business-to-Business Exchange, Business-to-Consumer, Consumer-to-consumer, Business-to-Government, Government-to-Government. The new age of information-based Marketing, Emergence of internet as a competitive advertising media, Market Research, Weakness in Internet Advertising, e-Advertising & Marketing.

UNIT III: **Electronic Payment Systems & EDI -** Introduction to Payment Systems, On-Line Payment Systems, Pre-Paid e-Payment System, Post-Paid e-Payment System, Requirements Metrics of a Payment System. EDI - Definitions & Applications, Standardization and EDI, EDI- Legal Security and Privacy Issues, Advantages & Limitations of EDI.

UNIT IV: **E-Security -** Introduction to Cryptography, Public & Private Key Cryptography, Securing the Business on Internet- Security Policy, Procedures and Practices, Transaction Security, Digital Signatures, Security Protocols for Web Commerce.

UNIT V: **e-CRM -** CRM, what is e-CRM and its Applications, The e-CRM Marketing, Major Trends, Global Scenario for e-CRM, CRM utility.

Text Books

1. Jeffrey F. Rayport & Bernard J. Jaworski, *Introduction to E-commerce*, TMH.
2. Kalakota & Winston, *Frontiers of E-commerce*, Pearson Education.

Reference Book(s)

1. David Whiteley, *E-Commerce - Strategy Technologies and Applications,* Tata Mc-Graw Hill.
2. Kamalesh K Bajaj & Debjani Nag, *E-Commerce, the Cutting Edge of Business*, Tata McGraw-Hill.
3. Bharat Bhaskar, *Electronic Commerce,* Tata Mc-Graw-Hill.

ELECTIVE III: Computer Animation (Term VI)

L-T-P (3-0-0)

UNIT I: **Digital Animation.** Using wacom for drawing - tracing and cleanup, Draw 2 characters, Creating staging in flash, using library, Create one flash animation project, Rigging of characters – bones, Rig the main character of the project, Creating turnarounds in flash, Create turnaround of the given character Creating straight to and frame by frame animations – tweens, Falling drops, Walk cycle - animating characters, Dog and man walking, Nesting the movie clips, Create an animated face with eyes, Lip sync - importing sound, Animating lip sync with provided sound track (happy birthday!...), Exporting and titling in flash, Create a splash title, Creating special effects and compositing - masking, transitions, filters, Create lightning effect, fireflies buzzing by Short movies, Flash production pipeline lecture, Character cutout, turnaround of a robot

UNIT II: **Flash Gaming.** Creating game objects, creating game bgs – levels, Creating gaming logics, Assembling and executing the complete game**.**

Animation & Digital Cinema Production. 2D to 3D Pipeline, 3D visualization of Platonic Solids and Polygons, Story and Script writing. Writing and reciting a story, Storyboard Creation (1), creating thumbnails, Storyboard Creation (2), Creating storyboard panels, Introduction to interface of MAYA, Introduction to interface of Z-BRUSH, Introduction to interface of MUDBOX

UNIT III: **Maya Pipeline & Interface** Creating and editing Primitives, Creating Text, Introduction to Hypershade, Creating Marble, Wood, Glass and Metal Shaders, Introduction to Digital Lights, Exploring Lights and shadows. Introduction to Render Engines in Maya, Explore different render engines, Introduction to camera, Animating a camera along a motion path, Introduction to deformers, Deforming Primitives to form different shapes, Paper Folding (Origami)

UNIT IV: **Architectural & Props Modeling.** Introduction to NURBS modeling, Creating a Chandelier, NURBS Tools, Creating a MAG-Wheel, Introduction to Polygon modeling, Create a dining table with chairs, Interior Modeling, Model a Kitchen, Exterior Modeling, Model a Farm house, Landscape Modeling, Model a backyard with trees and fence, Vehicle modeling, Modeling a Concept Car

Organic Modeling. Introduction to Anatomy, Creating a cartoon character, Model goofy, Creating a Realistic Human Face (Male), Male Head, Creating a Realistic Human Face (Female), Female Head Creating a Realistic Human Torso, Male and Female Torso, Creating a Realistic Human Hands and feet, Modeling Hands and Feet, Modeling Hair, Modeling Cloth, Adding Details in MUDBOX, Detailing the Modeled character, Adding Details in Z-Brush, Detailing the Modeled character Clay modeling session, Modeling for video games, Speed modeling challenge (head), Modeling a cartoon Character

UNIT V: **Texturing.** Basics of UV mapping, Unwrapping the House model, Unwrap the Kitchen model, Unwrapping techniques for Character, Unwrap the modeled character, Photoshop

Basics, Editing and Manipulating images, Creating Brushes, Filters and Patterns, Create Textures for the Kitchen Model, Maya-Photoshop Pipeline, Texture the Human Character, Introduction to 3D Painting in Maya, Texture the Backyard, Polypaint in Z-Brush, Texture the character, Exporting textures and normal maps from Z-Brush to Maya.

Text Books:

1. Richard Williams, *The Animator's Survival Kit*, Faber and Faber.

2. Derakhshani, *Introducing Maya 2008*, Sybex.

ELECTIVE III: Software Project Management (Term VI)

L-T-P (3-0-0)

UNIT I: **Introduction to project management concepts** - Concept of Management- key players and their role in a project, coordination and communication issues. Software product scope, problem decomposition. Generic phases in Software Process, Software engineering paradigms- linear sequential model, prototyping model, incremental model, spiral model. Project overview, W5HH Principle.

UNIT II: Software process and project metrics - Concept of measures, metrics, and indicators. Process metrics, software measurements – size oriented metrics, function oriented metrics, metrics for Software quality, factors effect quality, measuring quality, defect removal efficiency.

UNIT III: Software project planning - Project planning objectives, Software scope- information gathering, feasibility. Estimation of Resources, Software project estimation, LOC based estimation, Function Point based estimation, process based estimation, COCOMO model, automated estimation tools.

UNIT IV: Risk analysis and management - Risk analysis management concept, Reactive Vs. Proactive Risk Strategies, Software risks, Risk identification- assessing overall project risk, risk components and drivers. Risk projection- risk table, assessing risk impact. Risk Mitigation, Monitoring, and Management. Safety Risks and Hazards

UNIT V: Project scheduling and quality management - Basic concepts, scheduling principles, defining tasks for project. Scheduling techniques- timeline charts, tracking schedule. Earned Value Analysis (EVA). Error tracking, Project Plan. Quality concepts, Software Quality Assurance (SQA), SQA activities, Software Reviews, Formal Technical Review. ISO 9000 Standards.

Text Books:

1. R. S. Pressman, *Software Engineering: A Practitioners Approach*, McGraw Hill.
2. Bob Hughes, Mike Cotterell, *Software Project Management*, Tata McGraw Hill.

ELECTIVE III: Web Technologies for E-Commerce (Term VI)

L-T-P (3-0-0)

UNIT I: **Introduction.** Drivers behind E-Commerce, Types of E-Commerce, E-Commerce Business Models The HTTP Protocol, HTML, Client-side programming, JavaScript, Server-side programming, Java servlets, XML.

UNIT II: **Security and cryptography**. Encryption, Secret vs. Public key encryption, DES, RSA, Authentication, Integrity and non-repudiation, Message Digests, Digital Signatures, RSA Signature, DSA Signature, Digital Certificates, The SSL Protocol, Java Crypto APIs, Web Security.

UNIT III: **Payment systems**. Credit Card Payments and the SET protocol, Electronic Cash, Smart Cards, Technology and standards, An Example: The Java Card, Programming the Smart Card, E-Checks, Micropayment Protocols (ex. Millicent)

UNIT IV: **Online Business/trading and case-studies**. Internet Auctions, Supply Chain Management, Case Studies, dot com versus brick, and mortar versus clicks and bricks.

UNIT V: **Optional topics**. Elliptic Curve Cryptography, Advanced Encryption Standard, SPKI/SDSI, JSP and Beans, Commercial E-Commerce Software (ex. Microsoft BizTalk), M-Commerce, Web Search Engines.

Texts Book(s)

1. E-Commerce - Business, Technology and Society, Laudon and Traver, Addison Wesley.

2. E-Business and E-Commerce - How to Program, Dietel, Dietel and Nieto, Prentice Hall.

Reference Book(s)

1. W. Lehnert, *The Web Wizard's Guide to HTML*, Addison Wesley.

2. S. Estrella, *The Web Wizard's Guide to JavaScript*, Addison Wesley.

3. W. Stallings, *Network Security Essentials - Applications and Standards*, Prentice Hall.

ELECTIVE III: Cyber Laws (Term VI)

L-T-P (3-0-0)

UNIT I: Cyber world: an overview, Internet and online resources, security of information, intellectual property (IP), historical background of IP, IPR governance, National patent offices, the world intellectual property organization (WIPO).

UNIT II: Concept of Cyberspace & Netizens, Technology, Law and Society, Object & Scope of the Information Technology Act, 2000, Electronic Records, Electronic Governance and Electronic Commerce

UNIT III: Jurisdiction under the IT Act-Territorial and Extra-Territorial Jurisdiction of the IT Act 2000, Concept of Digital Signatures and Cryptography, Digital Signature Certificate and Public Key Infrastructure, Authorities under the Act.

UNIT IV: Nature and scope of computer crime, Types of Cyber crimes- Hacking, Tampering with Computer source documents, cyber pornography, cyber stalking, cyber terrorism, cyber squatting, Cyber contraventions, Penalties under the Act, Investigation, Procedure for search & Seizure, Liability of Network Service Providers.

UNIT V: Intellectual Property Right issues in Cyberspace, Concept of property in Cyberspace, Copyright and related issues, Issues relating to Trademarks and Domain names, Liability for Hyperlinking and Metatags, Domain Name Dispute Resolution Policy, Role of ICANN.

Text books:

1. Rodney Ryder, *Guide to Cyber Laws*, LexisNexis Butterworths.
2. Vakul Sharma, *Handbook of Cyber Laws*, Macmillian Publishers.
3. Justice Yatindra Singh, *Cyber Laws*, Universal Law Publishing Co.
4. Dr. Sundeep Oberoi, *E-Security and you*, Tata Mc-Graw Hill.

ELECTIVE IV: Animation & Digital Cinema Production (Term VI)

L-T-P (3-0-0)

UNIT I: **Introduction to Animation Principles**: Bouncing Ball Animation, Animate a Rubber, Metal and a Plastic ball, Animating Simple gears and levers using Expression, Animate a clock Mechanism Constrain based animation; animate a Piston and Hydraulic Mechanism, Animating Vegetation Animating trees, Grass and Plants.

UNIT II: **Rigging.** Deformers and their Functions in Rigging, Rigging a Robotic Arm using constraints and set driven keys, Rig and animate a robotic arm to grab an object and change its position, Biped Character Rigging (1), Creating joints for the Leg and Reverse foot, Biped Character Rigging (2) Creating Joints for Spine, Ribs, Hand and Head, Biped Character Rigging (3), Creating Controls and connecting them to joints, Facial Rigging , creating facial expressions using blend Shapes and Joints, Lip Sync, Creating phonemes and visimes using blend Shapes and Joints, Creating IK - FK switch (advance), Creating IK - FK switch for Hand, Creating stretchy IK (advance), Creating stretchy IK for hand, Leg and Spine, Creating user interface for facial rig (advance) Creating user interface for facial rig.

UNIT III: **Animation II.** Creating a treadmill walk cycle, Creating a treadmill run cycle, Creating a progressive walk cycle, Creating a progressive run cycle, Creating a run and jump sequence, Animate a character running and jumping over a hurdle, Showing weights and secondary action in animation Animating a character climbing a cliff.

UNIT IV: **Lighting & Rendering.** Three point lighting techniques, Setup 3 point lighting for the character, Interior lighting techniques, Setup standard lights for the kitchen, Exterior lighting techniques, Setup standard lights for the backyard, Light effects, Creating different weather conditions and time of day for the backyard, Introduction to Photons and Global illumination, Setup lighting for kitchen using Mental ray, Introduction to final gather and HDRI, Setup lighting for backyard using Mental ray , Introduction to caustics, Creating and rendering a realistic glass of water, Introduction to ambient occlusion, Explore ambient occlusion for various models.

UNIT V: **Dynamics.** Introduction to Rigid Bodies, Create a snooker Board simulation, Rigid Body constraints, Create a sea saw simulation, Particle Systems, Dynamic Fields, Creating rain and snow, Particle types and render nodes, Creating fire, sparks, dust and smoke, Particle Sprite Sequence, Leaves and flowers falling from a tree, Particle Instancing, Rain of arrows in a battle sequence, Soft bodies. Create an ocean surface and float an object. **Post Production.** Importing images, sequences and sound, Editing and compositing audio and video animate a logo, view effects and transitions, Creating titling, exporting to different standards.

Text Books*:*

1. Lynne S. Gross, *Digital Moviemaking*, Cengage Learning.

ELECTIVE IV: Software Economy & Trade (Term VI)

L-T-P(3-0-0)

UNIT I: Basics of Modern Businesses & Economic Systems. The Business of Software, Strategies for Software companies, Software entrepreneurship.

UNIT II: Software Industry: Software Products and Software Production Systems, Software Services, Software Projects and management, Human capital development for Software Economy, best practices of software development, the software factory.

UNIT III: Software Engineering Economics: Cost estimation technologies, commercial-off-the-shelf (COTS) software, software reuse, application generators and fourth generation languages. Evaluation of contemporary cost estimation methods in terms of: openness of underlying models, platform requirements, and data required as inputs, output and accuracy of estimates provided by models. COCOMO I and II, and COSYSMO as examples of a cost model, Function point cost estimation models.

UNIT IV: Cyber laws and Software Business : Trade Secret Protection, Copyright Law, Patent Protection, Trademark and Trade Dress, Sui Generis Protection of Computer Technology, Software Licensing, Antitrust in the Computer Industry, International Protection of Computer Technology, Jurisdiction and Choice of Law, Intellectual Property in Cyberspace, Content Regulation, Computer Crimes, Privacy, Anonymity and Encryption, Electronic Commerce, Internet Governance.

UNIT V: Emerging Software Products: Software Project Experience, Freeware and Open Source Softwares, Case Study: Linux.

Text books:

1. M. A. Cusumano, *The Business of Software*, Free Press/Simon & Schuster.
2. Stephan Kudyba, Romesh K. Diwan, *Information Technology, Corporate Productivity, and the New Economy*, Greenwood Publishing Group.
3. Barry W. Boehm, *Software Engineering Economics*, Prentice Hall.

ELECTIVE IV: Enterprise Resource Planning (Term VI)

L-T-P(3-0-0)

UNIT I: **Introduction.** ERP: An Overview, Enterprise – An Overview, Benefits of ERP, ERP and Related Technologies, Business Process Reengineering (BPR), Data Warehousing, Data Mining, OLAP, SCM

UNIT II: **ERP Implementation.** ERP Implementation Lifecycle, Implementation Methodology, Hidden Costs, Organizing the Implementation, Vendors, Consultants and Users, Contracts with Vendors, Consultants and Employees, Project Management and Monitoring

UNIT III: **The business modules.** Business modules in an ERP Package, Finance, Manufacturing, Human Resources, Plant Maintenance, Materials Management, Quality Management, Sales and Distribution

UNIT IV: **The ERP Market.** ERP Market Place, SAP AG, Peoplesoft, Baan, JD Edwards, Oracle, QAD, SSA

UNIT V: **ERP – Present and future.** Turbo Charge the ERP System, EIA, ERP and e-Commerce, ERP and Internet, Future Directions

Text Book

1. Alexis Leon, *ERP Demystified*, Tata McGraw Hill

Reference Book

1. Joseph A Brady, Ellen F Monk, Bret Wagner, *Concepts in Enterprise Resource Planning*, Thompson Course Technology.
2. Vinod Kumar Garg and N. K. Venkitakrishnan, *Enterprise Resource Planning – Concepts and Practice*, PHI.

ELECTIVE IVL E-Governance Case-Studies (Term VI)

L-T-P(3-0-0)

(Under development)

Courses from other departments

1. **Basic English (Term I)**
2. **Professional Ethics & Responsibility (Term I)**
3. **Effective English (Term II)**
4. **Environmental Studies (Term II)**

Annexure-XI-B of Agenda Item no. 6.10

Draft Ph.D. Ordinances

SHARDA UNIVERSITY

Plot No. 32, 34, Knowledge Park-III, Greater Noida – 201306 (UP)

Ordinances for Doctor of Philosophy (Ph.D.).

Sharda University established as a state private university in Greater Noida through the U.P. State Legislative Act in 2009 and approved by UGC, hereby makes the following Ordinances, regarding Doctor of Philosophy (Ph.D) programme.

1. SHORT TITLE, APPLICATION AND COMMENCEMENT

1.1 These Ordinance shall be called the Doctor of Philosophy (Ph.D.) Ordinances, 2012".
1.2 These Ordinance shall come into effect as per notification.
1.3 The University shall award Doctor of Philosophy (Ph.D.) degrees in the disciplines of Science, Engineering and Technology, Management, Arts, and Humanities etc. These Ordinance shall not be applicable to the Medical and Dental Faculty.
1.4 There will be Board of Research (BoR), Central Research Committee (CRC), Departmental Research Committee (DRC) and Student Research Committee (SRC).
1.5 All the papers for approval of the vice-chancellor will be processed through CRC
1.6 The term of all the committees prescribed in these Ordinances will be for two years.
1.7 Before admission process starts, the number of students to be admitted in each subject will normally be displayed on the university website

2. ELIGIBILITY FOR ADMISSION

An applicant possessing any one of the following qualifications shall be eligible to apply

(a) Masters degree in respective discipline with a minimum Cumulative Grade Point Average (CGPA) of 6.75 on a 10 point scale or 60% marks in aggregate (of all the years/semesters) where marks are awarded.
(b) In exceptional cases a candidate with a B. Tech/ BS degree with minimum 75% marks or CGPA of 8.0 may be directly enrolled in Ph.D in relaxation of the prescribed qualifications, provided he/she has 05 years professional experience.
(c) Interdisciplinary research is also allowed and the qualifications will be decided on case to case basis by CRC

3.0 ENTRANCE TEST

3.1 The University shall conduct an entrance examination followed by a group discussion/ interview for admission to Ph.D. Programme. The examination shall be conducted either at the University premises or through any other mode which the University deems suitable.

3.2 For admission in the Ph.D. programme advertisement will be made and displayed on SU website giving total number of seats in each department. Entrance examination shall be conducted twice in an academic year on a suitable date preferably in December and June. The CoE of SU will conduct the entrance examination.

3.3 Short listing of applications for the purpose of entrance test/interview will be done by concerned DRC.

3.4 The interviews will be conducted after entrance test (normally next day) by committees constituted by the Dean of concerned school as per criteria laid down by CRC.

3.5 The committees would consider criteria such as the performance in the entrance test, interview**,** papers published, patents and any other distinction as decided by CRC.

3.6 UGC/CSIR (JRF), NET/GATE qualified candidates may be exempted from appearing in the entrance examination. However, they will necessarily have to undergo an interview.

37. Faculty members of SU and Sharda Group of institutions may be exempted from appearing in the entrance examination. However, they will necessarily have to undergo an interview.

3.8 CoE will declare the result on the recommendation of CRC and approval of vice-chancellor.

4.0 ADMISSION AND REGISTRATION

4.1 Admissions will be made after the candidate qualifies the entrance test/interview and deposits the fees within the time as per notification.

4.2 The students shall be provisionally registered for Full-time and Part-time Ph.D. Programme at the initial stage and the date of provisional registration will be from the date decided by CRC.

4.3 The candidates working elsewhere (both as teacher and non teacher), in academic institutions, industries or research laboratories may be registered as Part Time candidates provided no objection certificate (NOC) from the employer is submitted. Teaching and non teaching candidates from SU seeking admission to Ph.D. programme will be considered as part time student.

4.4 A student of foreign nationality can be considered for admission if recommended by the competent authority of Government of India.

4.5 A foreign student can also be admitted and the entrance test/interview shall be performed online/personal interview and other formalities can be decided on case to case basis by CRC.

4.6 Every student shall be required to register in each semester by paying the requisite fee. The first installment of fees will be deposited within the notified time but second and consecutive installments after every six month from the date of provisional registration (within 15 days from due date). Faculties and employees of SU if enrolled for Ph.D. degree are required to pay the fees as per SU rules. Any student failing to register for two consecutive semesters will be considered to be withdrawn from the programme. After due date late fees will be charged as per university rules.

5.0 SUPERVISOR

5.1 An admitted student shall be assigned a Research Supervisor(s) by the concerned Dean on the recommendation of DRC and the preference of the student.

5.2 A Supervisor(s) can be any full-time faculty member/adjunct faculty/visiting professor of SU with a Ph.D. degree and 02 research papers published in SCI/ indexed Journals.

5.3 Persons of imminence having vast experience in industries/research organizations without Ph.D degrees may also be considered as research guides on recommendation of the DRC and approval of the Vice Chancellor provided they require other requirements.

5.4 The Supervisor shall be appointed during the course work.

5.5 The candidates working elsewhere in academic institutes may opt for a co-supervisor(s) not exceeding a total of two co supervisors to supervise the student from their work place or any other institution of repute after approval of the DRC and the Vice Chancellor. The qualification is the same as that of supervisor.

5.6 Change of guide, if deemed necessary by the DRC, can be considered by respective Deans and put up to the Vice Chancellor for approval.

5.7 In case a supervisor retires, leaves the university or any other genuine reason, Dean may appoint a new supervisor on the recommendation of DRC.

5.8 The Registrar of the University shall maintain the database of the research students and supervisors, both internal and external.

6.0 COURSE WORK

6.1 Each student having M.Tech/MBA/LLM will be required to take a minimum course work of 12 credits (one semester). However those with B.Tech degree/ Master Degree (Arts, Science and Commerce) will be required to take courses of at least 20 credits (two semester). A paper on research methodology will be compulsory. Other paper(s) will be prescribed by the supervisor(s). The courses will be designed by SRC and approved by vice chancellor on the recommendation of DRC.

6.2 A candidate will not be allowed to take more than 12 credit course in one term.

6.3 The minimum CGPA requirement for the course work is 7.0 on a 10-point scale. If the CGPA at the end of any term is above 6.0 but less than 7.0, the student shall be asked to take more courses or repeat in order to make up the CGPA.

6.4 Candidates shall not be allowed to pursue any other course/ programme during the tenure of their Ph.D. Programme.

6.5 During the course work, every student is expected to attend all the classes. However only those students will be allowed to appear in the examination who have at least 75% attendance.

7.0 COMPREHENSIVE EXAMINATION AND RESEARCH PLAN

7.1 Each student will be required to have comprehensive viva voce examination which will test student's comprehension of his broad field of research and his academic preparation and potential to carry out the proposed research plan. The comprehensive examination as per guidelines proposed by DRC and approved by CRC will be an oral

examination and will be conducted by SRC with an external expert proposed by SRC and approved by VC.

7.2 The committee on the basis of comprehensive viva voce examination may make one of the following recommendations:
(i) Passed
(ii) To reappear comprehensive viva voce examination after a defined period of time specified by the above committee

7.3 A student will normally be provided a maximum of two attempts to pass the comprehensive examination.

7.4 After the student clears the comprehensive viva voce examination, he/she is required to submit a research plan in consultation to the supervisor(s) which will be evaluated by CRC.

7.5 The research plan must be approved by the supervisor and co supervisor(s)(if any). The candidate shall be required to present his/her research plan before CRC. CRC may approve or recommend modifications. The supervisor (s) will be special invitee to the particular meeting of CRC.

7.6 CRC on the basis of clearing of comprehensive viva voce examination and approval of research plan presentation will recommend the registration of the student in the Ph.D. programme for the approval of vice chancellor.

7.7 Normally pre Ph.D. courses, comprehensive examination and evaluation of research plan should be completed within a maximum of 18 months from the date of provisional registration.

7.8 Normally if the candidate does not clear the above in stipulated period of time he/she may be dropped from the Ph.D programme.

8.0 FINAL REGISTRATION

After successful completion of course work, comprehensive examination and evaluation of research plan, the student will be finally registered for Ph.D programme by concern Dean. Normally the date of registration will be the date of approval of Research Plan. However in exceptional cases, CRC may decide the date with the approval of vice chancellor. The registration number and date of registration will be issued by Admission cell.

9.0 RESEARCH ASSISTANTSHIP:

The candidates provisionally selected for Ph.D. Programmes may be given Teaching/ Research Assistantship, if recommended by DRC as per the rules of the University. The maximum number of Assistantships will be decided by the University on year to year basis. A student may also avail a Assistantship out of the research projects grant (if any) funded by Government agencies to his/her supervisor based on availability of funds and eligibility of the candidate.

10.0 REVIEW OF THE PROGRESS OF THE STUDENTS

10.1 The academic/research progress of each student/candidate will be monitored by SRC. For this purpose, each candidate will be asked to submit a progress report at the end of each semester to his/her supervisor(s). On receipt of the progress report, the supervisor(s) shall arrange with DRC for a review.

10.2 If the two consecutive progress reports are found unsatisfactory, the candidate may be dropped from the Ph.D. programme after the approval of vice chancellor.

10.3 Change in the research topic, if deemed necessary, may be considered after due approval of the SRC, DRC and the vice chancellor.

11.0 RESIDENTIAL REQUIREMENTS:

The minimum residency for full time research scholars shall normally be two years from the date of formal registration for all the candidates. However the time requirement can be relaxed on case to case basis on the recommendation of SRC/DRC/CRC and approval of vice chancellor. A part time candidate must spend at least six months on campus during the registration period either in one stretch or in parts. For this purpose a certificate from supervisor and approved by DRC will be issued.

12.0 TIME LIMIT FOR THESIS SUBMISSION SHALL BE AS UNDER

12.1 The candidate can submit his/her Ph.D.thesis only after 24 months of registration.

12.2 The candidates of all categories shall normally submit their thesis within a period of five years from the date of their initial registration for the Ph.D. Programme. However, as a special case, this limit may be extended to a maximum of seven years by the recommendation of SRC and approved by DRC and vice chancellor after which the registration shall stand cancelled automatically.

13.0 TRANSFER OF REGISTRATION

13.1 If a student is already registered for Ph. D. programme in some other University/Institute in India or abroad and has passed pre Ph.D. courses by getting 7.0 CGPA or more and cleared comprehensive viva voce examination or its equivalent, the total credit can be transferred to Sharda University on the recommendation of concerned DRC.

13.2 If a person has done research work in any other University/Institute in India or abroad as per work plan to be approved by DRC and CRC, due recognition may be given for that research work. However he/she can submit the thesis only after a period which shall not be less than 01 year and has published/accepted at least two research papers in indexed journals out of which atleast one research paper will be published during his/her stay at Sharda University.

14.0 CONVERSION FROM FULL TIME TO PART-TIME PH.D. PROGRAMME:

Conversion from full time to part-time and vise versa of Ph.D. registration can be allowed only on the recommendation of DRC and approval of the Vice Chancellor. The conditions for part time registration shall remain the same.

15.0 ATTENDANCE REQUIREMENTS/LEAVE RULES:

15.1 A minimum of 75% attendance is required during each term during the course work. In case attendance falls short of 75% in any course during a term, the student will not be paid Research Assistantship for the subsequent term. The candidate shall not be allowed to write the end term examination and awarded an F Grade in the course in which the attendance falls below 75%. The candidate will be allowed to re-register for the course and all credits/ marks in the Mid Term Examination (MTE) and assignments shall be treated as null and void.

15.2 A full time research scholar after having completed the course work must attend to his/ her research work on all the working days and mark attendance except when he/ she is on duly sanctioned leave. Leave without approval of the Research Supervisor will be considered as an act of indiscipline and will be dealt with as per rules of SU.

15.3 A research student awarded Research Assistantship will be governed by the rules of SU.

15.4 A research student not awarded Teaching/ Research Assistantship will be treated at par with postgraduate students for provisions of leave etc.

15.5 A women research scholar will be allowed to take one year off for maternity leave.

15.6 A proper leave account of each student shall be maintained by the Deptt. / Centre/ Programme co-coordinator as per the University rules.

16.0 THESIS REQUIREMENT & EVALUATION

16.1 Holding of Pre-Ph.D. seminar is an essential requirement before the SRC considers the synopsis/summary of the thesis of a Ph.D. student. On completion of the research work, the candidate shall submit to DRC/CRC through supervisor(s), 8 copies of the synopsis including bibliography of research work. The Ph.D student will be required to defend the summary of the draft thesis before the DRC, faculty members and research students. Based on the performance, the DRC would either recommend submission of thesis or ask the candidate to carry out further research and re-submit the work within 6 months. If the work of the candidate, even after the expiry of six months, is not found satisfactory by the DRC, the case will be referred to CRC for appropriate decision. The candidate will be allowed to submit the thesis only when he/she publishes or has acceptance of two research papers in a refreed indexed journal.

16.2 The thesis as approved by the guide & DRC will be submitted to the Controller of Examinations (CoE), who in turn will forward the thesis to the expert members. The supervisor will suggest names of the experts from any premier institute/ university/organisation in the relevant area to the concerned DRC. The panel must consist of minimum six experts from India and five from abroad. DRC will forward the names to CoE for approval of the Vice Chancellor. The Vice Chancellor shall approve names of two experts one each from India and abroad. Two experts shall be kept in the panel as stand by, one each from India and abroad. In addition the supervisor(s) will also be examiner.

16.3 The research student shall submit normally six hard bound copies of the thesis (along with a soft copy) through the supervisor(s) along with the following to the Controller of Examinations (CoE):

(a) A summary of thesis, important results and publications.
(b) A no-dues certificate from all concerned.
(c) A copyright certificate and undertaking that the work is of original nature.
(d) Proof of having two research papers accepted/published in refreed indexed journals.

The certificate at (c) will be signed by the candidate and countersigned by the supervisor and the certificate at (d) will be signed by the candidate and supervisor.

16.4 The CoE will send the synopsis/summary of thesis to all the examiners approved by the vice chancellor for their consent for evaluation. On receipt of the consent from the expert members, the thesis in hard and soft copy would be sent to them for evaluation. If the consent of the experts is not received within one month, CoE will send the summary of thesis to the next expert as approved by the Vice Chancellor.

16.5 The examiners will be required to submit their evaluation report (either a hard copy or soft copy) within 3 months from the date of dispatch of the thesis.

16.6 In case, minor modifications are suggested by the expert examiners, the same shall be communicated to the candidate to be incorporated in the thesis for final submission prior to Viva Voce examination.

16.7 In case major modifications are suggested, the same shall be communicated to the student and detailed point wise reply suggesting incorporation or amendment undertaken in the thesis will be re-sent to the examiner for evaluation before Ph.D. viva voce examination is held.

16.8 In the event of disagreement between the examiners, the vice chancellor may appoint another examiner, if the merit of the case so demands and the decision of such examiner will be final.

16.9 In case, the experts accept submission of the thesis without any major modifications, chairman DRC will process for viva Voce examination of the research scholar and he shall be required to present his/ her work before the supervisor(s), one of the external examiners nominated by VC, research students, faculty members, DRC and other University authorities. Finally, on successful completion of the viva voce examination, the result will be declared by CoE on the approval of VC and the candidate will be awarded the Ph.D degree in the convocation of the University.

16.10 The thesis shall normally be written in English in the specific format and shall contain a critical account of the candidate's research. It should be characterized by discovery of facts, of fresh approach towards interpretation of facts and theories or significant contribution to knowledge in areas of design/ development, or a combination of them. It should bear evidence of the candidate's original work.

17.0 AWARD OF DEGREE:

17.1 On receipt of report from the chairman DRC, the CoE will issue a letter indicating therein that all requirements for the award of the PhD degree have been completed and the candidate shall be awarded the degree in the convocation of the University.

17.2 The office of the Controller of Examinations shall lay on the table of the Academic Council the one-page resume of the thesis for ratification and award of Ph.D degree to the candidate. The names of such candidates shall also be included in the agenda of the Executive Council for information either before or after the convocation is held.

18.0 CONSTITUTION OF BOARD/COMMITTEES:

18.1 Board of Research:

In order to implement PhD Programmes, the university shall constitute a Board of Research nominated by the Vice Chancellor. Constitution of the Board for each department shall be as under:

Vice Chancellor	Chairman
Pro-Vice Chancellor/Senior most professor (In the absence of Pro vice chancellor)	Member
Chairman CRC	Member (convener)
Deans of Schools	Member
Director RTDC	Member
Three eminent academicians nominated by the Vice Chancellor for a period of two years	Members

The Board shall be responsible for all academic policy matters and clarifications, wherever required, during the implementation of these Ordinances.

18.2 The Constitution of the CRC

1. Nominee of vice chancellor	Chairman
2. Deans of Schools	Member
3. Director RTDC	Member
4. CoE	Member

18.3 Constitution of the DRC

1. HOD/Nominee of Dean from the Department(s)	Chairman
2. Professors, One assoc. Professor and One assistant Professor with Ph.D. Degree	Members
3. Concerned Supervisor(s)	Invited as and when required

If sufficient number of professors is not available in a single department, two or three departments may be clubbed together in one DRC.

18 .4 Constitution of SRC

(a) Nominee of Dean of school from the Department(s) - Chairman
(b) One expert in the field from the Department/Centre - Member
(c) One Institute faculty expert, preferably in the concerned area, from outside the Department/Centre to which the student belongs - Member
(d) Supervisor(s). - Member
Experts at (b) and (c) above will be nominated by DRC from amongst those proposed by Supervisor(s).

18.5 The chairpersons of DRC and SRC will not be the same person and preference will be given to senior persons.

19.0 **PLAGIARISM:**

In case of any plagiarism reported against the candidate at any stage of the research work, the DRC may inquire into the allegations and if found correct shall expel the student from the University and the COE shall circulate this information to all registered universities in the country. In case plagiarism is reported after the award of the degree, the DRC shall investigate the charges and pass on the report to the Academic Council. The Academic Council may decide to withdraw the degree from such a student and consequently the candidates name shall be removed from all official records of the University. The university may also initiate legal proceedings as per relevant law.

20.0 POWER TO RELAX:

Notwithstanding anything contained in these Ordinances, the Academic Council in exceptional circumstances and on the recommendation of CRC and BoR shall be authorized to relax any of the provisions of the said Ordinances.

The provision(s) not contained in these Ordinances, shall be considered included, if the said provision(s) is/ are recommended by the CRC and approved by the Vice Chancellor for a class or category of students.

21. DEPOSITORY WITH UGC

Following the successful completion of evaluation process and the announcement of Award of the Ph.D. degree, a soft copy of the Ph.D. thesis will be sent to the UGC within a period of 30 days.

22. GENERAL

Not withstanding anything in these Ordinances, all the Ph.D students will be governed by the rules and procedures framed by the University in this behalf, and on matters of general discipline and in force time to time.

Ordinances

Master of Technology (M.Tech) Programmes

Sharda University
Greater Noida

SHARDA UNIVERSITY

Plot No. 32, 34, Knowledge Park-III, Greater Noida – 201306 (UP)

Ordinances for Master of Technology (M. Tech.)

Sharda University established as a state private university in Greater Noida through the U.P. State Legislative Act in 2009 and approved by UGC, hereby makes the following ordinances.

These ordinances shall be called the Master of Technology (M. Tech.) ordinance, 2012" and these ordinances shall come into effect as per notification.

1. INTRODUCTION

Sharda University provides science-based engineering education with a view to produce quality engineer-scientists. The curriculum provides broad based knowledge and simultaneously builds a temper for the life long process of learning and exploring. At the postgraduate level, students are encouraged to look beyond their area of specialization to broaden their horizons through open electives.

The medium of instruction in the University is English.

The University follows the Semester system. An academic year runs as per Academic Calendar where the detailed schedule is given and available before the start of the Semester.

2. M.TECH PROGRAMMES

Sharda University offers a number of M.Tech programmes for students with a wide range of backgrounds. Each course of M.Tech programme is offered by an academic unit which could be a department or centre. Following are the University approved M.Tech programmes.

M.Tech Programmes

Biotechnology and Bioinformatics, Computer Science and Engineering, Computer Networking, Energy and Environmental Engineering, GIS, MEMS Technology, Microwave Technology, Nanoscience and Technology, Polymer Science andTechnology, Power System Engineering, Production and Industrial Engineering, VLSI Technology.

However other M.Tech programmes may also be included in the above list with the approval of the University.

Eligibility of Admission is as per decisions of admission committee of the university.

3. DURATION

There are two types of M. Tech programmes:

(i) M. Tech Full Time programme spread over in 04 Semester (02 years).

(ii) M. Tech Part Time programme spread over in 06 Semester (03 years).

4. ADMISSION

Admission to M.Tech. programmes is based on performance in National level tests / entrance examinations/ interviews as decided by the university.

5. PROGRAMME COORDINATOR

Every programme is usually coordinated by a member of the teaching staff of the Department/Centre which is offering the programme. The coordinator shall be appointed by HOD. For some programmes, faculty from other departments/centres or even guest faculty can participate in the teaching and/or coordination of a programme. This faculty member is designated as the **Programme Coordinator**. He/she has the full responsibility for conducting the programme, coordinating the work of the other members of the faculty as well as teaching assistants involved in that programme, holding the tests and assignments, and awarding the grades. For any difficulty related to the programme, the student is expected to approach the respective programme coordinator for advice and clarification.

6. REGISTRATION

1. Registration is a very important procedural part of academic system. All students are required to register in person for each Semester for the programmes to be pursued by them, as per university rules, on the dates specified in the Academic Calendar.
2. Before the first day of classes, every student is required to be present on campus and validate his/her registration by logging in at the website. The updated registration record will be available on the website and the hard copy will be available with the student's programme coordinator. Students who do not do registration validation will not be permitted to attend classes.

7. FEES PAYMENT

Every student must pay the stipulated fees in full before the specified deadlines before registration.

8. REGISTRATION RECORD

In addition to web-based entries related to registration, the student should ensure that the same are entered on the Registration Record. Queries related to registration will be considered only when accompanied by the original Registration Record. This record must be preserved until the Semester grade card is received by the student.

9. REGISTRATION AND STUDENT STATUS

Registration by a student confirms his/her status as student at the University. Failure to register before the last date for late registration will imply that the student has discontinued studies and his/her name will be struck off the rolls.

Every registered student, except part-time postgraduate students, is considered as a full-time student at the University. They are expected to be present at the University and devote full time to academics.

10. LATE REGISTRATION

Late registration is permitted under the following conditions:

1. A student, who was not in the campus during the period of registration in the previous Semester, needs to complete the registration process on or before the first day of the Semester before commencement of classes.

   or

2. For reasons beyond his/her control, if a student is not able to register or send an authorized representative with a medical certificate, he/she may apply to the Dean for late registration. Dean will consider and may approve late registration in genuine cases on payment of an extra fee called late registration fee. Late registration is permitted until one week after the start of the Semester.

11. MINIMUM AND MAXIMUM STUDENT REGISTRATION IN A PROGRAMME

A particular programme will run if there are a minimum of 05 students. The maximum number of students in a programme will be 30.

12. ACADEMIC SESSION

The details of academic session will be provided in Academic calendar of the university. It is divided into three parts:

1. **Odd Semester**
2. **Even Semester**
3. **Summer Semester**

The Academic Programmes are based on credit system

13. ACADEMIC CALENDAR

The exact dates of all the important events, such as orientation, registration, late registration, commencement of classes, submission of documents, examinations, submissions of grades, vacation, Mid Semester break, etc., during the Academic Session are specified in the Academic Calendar of the School, approved by the Vice-Chancellor of the University.

14. CREDIT SYSTEM

Education at the University is organized around the Semester-based credit system of study. A student is allowed to attend classes in a course and earn credit for it, only if he/she has registered for that course. The prominent features of the credit system are a process of continuous evaluation of a student's performance/progress and flexibility to allow a student to progress at an optimum pace suited to his/her ability or convenience, subject to fulfilling minimum requirements for continuation.

A student's performance/progress is measured by the number of credits that he/she has earned, i.e. completed satisfactorily. Based on the course credits and grades obtained by the student, grade point average is calculated. A minimum CGPA of 6.0 is required to be maintained for satisfactory progress and continuation in the programme. Also a minimum number of earned credits and a minimum CGPA of 6.0 should be acquired in order to qualify for the degree.

All programmes are defined by the total credit requirement and a pattern of credit distribution over courses of different categories.

Transfer of credit may be allowed on case to case basis if the candidate has earned credits in other institutions in India or abroad as recommended by the department and approved by the Vice Chancellor.

15. GRADE POINT

The grades and their equivalent numerical points are listed in table 1.

Table.1 Grades and their description.

Grade	Grade points	Description	Range of percentage of marks (%)
A+	10	Outstanding	>90 and ≤ 100
A	9	Excellent	>80 and ≤ 90
B+	8	Very good	>70 and ≤ 80
B	7	Good	>60 and ≤ 70
C+	6	Average	>50 and ≤ 60
C	5	Below Average	>40 and ≤ 50
D	4	Marginal	>30 and ≤ 40
F	0	Very poor	
I	-	Incomplete	
NP	-	Audit pass	
NF	-	Audit fail	
W	-	Withdrawal	
X	-	Continued	

16. DESCRIPTION OF GRADES

D grade: 'D' grade stands for marginal performance; i.e. it is the minimum passing grade in any course. The minimum marks for award of 'D' grade are 30 %.

Student who obtains **D** grade will be required to appear in ESE to improve the grade point and if obtains a better grade point, the same will be incorporated in the grade sheet and their CGPA will be recalculated

A student has to repeat all courses in which he/ she obtain 'F' Grades until a passing grade is obtained. For the courses in which 'F' grade has been obtained, the student may take the same course or any other course from the same category.

I grade: An **'I'** grade denotes incomplete performance in any L (lecture), P (practical), and V (special module) category courses. It may be awarded in case of absence on medical grounds or other special circumstances, before or during the ESE period provided that she/he fulfils all requisite requirements to appear in ESE. **I** grade will be awarded only on the recommendation of a committee constituted by vice chancellor on the suggestion of Dean. The student will be allowed to appear for ESE and SSE.

Upon completion of all course requirements, the '**I**' grade is converted to a regular grade (A to F, NP or NF). '**I**' grade does not appear permanently in the grade card.

Requests for **I** grade should be made at the earliest but not later than the last day of ESE

NP and **NF** grades: These grades are awarded in a course that the student opts to audit. Only elective courses can be audited. Auditing a course is allowed until one week after the first MSE. The audit pass (NP) grade is awarded if the student's attendance is above 75% in the class and he/she has obtained at least 'D' grade. Course coordinator can specify a higher criterion for audit pass at the beginning of the semester. If either of these requirements is not fulfilled, the audit fail (NF) grade is awarded. The grades obtained in an audit course are not considered in the calculation of SGPA or CGPA.

W grade: A **'W'** grade is awarded in a course where the student has opted to withdraw from the course. Withdrawal from a course is permitted until one week after the first MSE. The **W** grade stays on grade card.

X grade: The 'X' grade is awarded for incomplete work in dissertation on a request made by the student.

17. COURSE CREDITS ASSIGNMENT

Each course, except a few special courses, has a certain number of credits assigned to it depending upon its lecture,tutorial and laboratory contact hours in a week. This weightage is also indicative of the academic expectation that includes in class contact and self study outside of class hours.

Lectures and Tutorials: One lecture or tutorial period per week per Semester is assigned one credit.
Practical/Laboratory *:* One laboratory period per week per Semester is assigned half credit.

Seminar and Dissertation are given additional credits.

Normally one period will be of 50 to 60 minutes.

A few courses are without credit and are referred to as non-credit (NC) courses.

18. CREDITS DISTRIBUTION*

SEMESTER	Courses (L-T-P)							Lecture Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	C-1-1 (3-1-0) 4	C-1-2 (3-1-0) 4	C-1-3 (3-0-0) 3	C-1-4 (3-0-0) 3	C-1-5 (3-0-0) 3	Foreign Language (1-0-2)2	Practical (0-0-4)2	6	16	2	6	24	21
II	C-2-1 (3-0-0) 3	C-2-2 (3-0-0) 3	C-2-3 (3-0-0) 3	C-2-4 (3-0-0) 3	C-2-5 (3-0-0) 3	Technical Communication (1-0-2)2	Practical (0-0-4)2	6	16	0	6	22	19
III	Seminar 2	Project 4	Dissertation 8					-	-	-	-	-	14
IV	Dissertation 12							-	-	-	-	-	12

C-X-Y (Course-Semester-Paper No.); L-lecture, T-tutorial, P-practical

Total

Credit – 66

* Department is free to decide the number of core and elective courses with at least one open elective and a minimum of core courses of 12 credits and can have as many courses with tutorials as it wants with a restriction that overall credits will not be less than 64 and not more than 68. The total credits in 1st and 2nd semester may range from 38 to 42

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19 EXAMINATIONS

19.1 Assessment/ Evaluation Procedure

The evaluation of students in a course is a continuous process and is based on their performance in different examinations/tests as mentioned below:

(A) Theory Courses

1. Continuous Assessment (CA) carrying 30 marks weightage.
2. Two Mid Semester Tests (MST) carrying 20 marks weightage. Each test will carry equal weightage.
3. End-Semester Examination (ESE) carrying 50 marks weightage.
4. Total marks in each theory course will be 100.
5. Total marks in each laboratory course will be 100.

(B) Laboratory Courses

1. Continuous Assessment (CA) carrying 60 Marks weightage.
2. End-Semester Examination (ESE) carrying 40 Marks weightage.

19.2 Continuous Assessment (CA) for theory courses

The Continuous Assessment shall be conducted by the concerned faculty and their associates (if any) who are taking classes and will be monitored by their respective Heads of the Departments/programme coordinators.

The class tests/ quizzes/ multiple choice question tests/ group discussions/ debates/ group activities, etc., can be conducted by the concerned faculty during the Semester as per his/her course plan.

The distribution of weightage given to each component during Continuous Assessment for theory courses is given below:

1. Quizzes (minimum 03) 9 Marks
2. Attendance 5 (details given below)*
3. Presentations/ Group Activities 10 Marks
4. Assignments 6 Marks

*** > 90%-5; 85-<90% - 4; 80-<85% - 3; 75-<80% - 2; 70-<75% -1(in case of approved absence)**

For students with attendance 90% or more, best two quizzes will be considered.

19.3 Mid Semester Test (MST) for theory courses

There will be two Mid Semester Tests during each Semester of one hour (60 minutes) duration for each course.

The MST will be conducted by the concerned school as per schedule given in Academic Calendar.

1. The date-sheet of the examination will be announced by the concerned School well in advance.
2. **In case, a student does not appear in a Mid Semester Test, he/she shall not be given another chance to appear in this examination under normal circumstances.**

19.4 End Semester Examination (ESE) for theory courses

There will be an End-Semester Examination at the end of each Semester of three hour duration for each course of 3-4 credits. However, 2 hour duration ESE can be conducted for a 1-2 credit courses.

1. The ESE will be conducted by the controller of examination as per the schedule mentioned in the Academic Calendar.
2. The Date-Sheet/Examination Schedule of ESE will be announced by the Controller of Examinations, Sharda University.

19.5 Evaluation for Laboratory Courses/Dissertation/Seminar

For the laboratory and practical works, the Continuous Assessment and End Semester Examination marks distribution shall be as follows:

Continuous Assessment		End-Semester Examination	
Components	**Weightage**	**Components**	**Weightage**
Record Mark (based on continuous assessment of Lab/ Practical works considering punctuality and timely submission of lab records)	40%	Lab experiment/ Procedure writing/ Tabulation/ Innovation etc. as applicable	30%
Viva-Voce(minimum of 04 quizes/viva voce)	20%	Viva-Voce	10%
Total	**60%**	**Total**	**40%**

DISSERTATION: 3rd Semester-Two presentation, each of 50 marks – Total 100 marks

4th Semester – Two presentations, each of 25 marks – Total 50 marks

Dissertation - 300 marks(Thesis will be evaluated by a Board of examiners consisting of one external examiner and two internal examiners including supervisor). The candidate is also required to submit at least one conference level paper with the thesis based on the dissertation work.

SEMINAR: 100 marks

Literature survey- 20 %

Write up - 30%

Two presentations – 50%

19.6. Summer Semester Course

1. A Summer Semester course may be offered by a department on the recommendations of HOD and approved by Dean
2. **A Summer Semester course is open to those students who wish to accumulate extra credits before the stipulated time or otherwise.**
3. The Summer Semester course may also be offered to the students who have not performed well in the ESE, provided such courses are offered by the department.
4. Department may offer a course (including both elective as well as open elective) during a Summer Semester subject to the condition that a student can register for a maximum of 12 credits.
5. Summer Semester course(s) will be announced by the office of Dean as per Academic Calendar. A student will have to register for the Semester within the time stipulated in the Academic Calendar, subject to the following conditions:

(i) If a student fails at the end of a Semester to achieve minimum required SGPA of 6.0 he/she shall be placed on ACADEMIC PROBATION during the Semester immediately following. He/She may either repeat the course(s) in which he/she has obtained, 'C', **'**D**'** or 'F' grade or opt for a new course of the same category/discipline/subject whichever is offered in the Summer Semester in order to complete the credit requirements.

(ii) A student under Academic probation can also opt for course (s) in which there is a backlog by either repeating or opting for a new course in Summer Semester in the same category/subject /stream.

(iii) A student not under Academic Probation but with a grade point of **C** or less than **C** in any of the course(s) may either repeat the course or opt for a new course in Summer Semester in the same category/subject/stream without earning extra credits. However CGPA shall be recalculated on the basis of higher marks.

(iv) In case of students desirous of moving along the fast track or to earn extra credit over and above the minimum required, they may register for the Summer Semester for a maximum of three course(s) provided these do not exceed 12 credits and have scored SGPA of 8 or more in the previous year. Registration procedure for this Semester will be on the pattern of the other regular Semesters and notified in advance. However, extra credit taken by a student will be counted for the calculation of CGPA.

6. The number of contact hours in any Summer Semester course will usually be the same as in the regular Semester course which is approximately 40. The assessment procedure in a Summer Semester course will also be same as that for a regular Semester course.
7. The effective duration of Summer Semester course shall be 7+1 weeks (Classes+ Examinations)
8. Further, withdrawal from a Summer Semester course is not permitted.

20. GRADING SYSTEM

20.1 Grades and Grade Points

Based on continuous evaluation, the academic performance of a student during a Semester shall be graded on a ten-point scale as per the following guidelines:

1. A student will be awarded a letter grade in each of the courses in which he/she is registered depending upon the weighted total marks he/ she obtains in the various components of evaluation as defined in the Course detail.
2. The following broadband letter grades will be used to report a student's performance. Each letter grade indicates the level of performance in a course and has an associated grade point value for purposes of computing the cumulative performance. There are 08 letter grades: A^+, A, B^+, B, C^+, C, D & F. The letter grades and their numerical equivalents on a 10-point scale (called Grade Points) are as follows:

Letter Grades	A^+	A	B^+	B	C^+	C	D	F
Grade Points	10	9	8	7	6	5	4	0

20.2 Guidelines for the Award of Grades

The following are the general guidelines for award of grades:

1. All evaluations of different components of a course outlined in the course plan shall be done in marks for each student.
2. The marks of various components shall be added to get total marks secured on a 10 point scale for theory courses and laboratory courses.
3. For any course, the statistical method shall be used for the award of grades with or without marginal adjustments for natural cut off.
4. **In case a student repeats a particular course during Summer Semester or along with his juniors he/she will be awarded only upto a maximum of A grade based on his/her current performance and the grade he/she has obtained.**

20.3 Repeating of 'F' Grade

'F' Grade is a fail grade. The course(s) in which a student has earned 'F' grade will be considered as back-log course(s). This grade is awarded when a student irrespective of having undergone through all the prescribed evaluation processes, has earned 'F' grade. Such a student may improve by repeating the

course(s) during Summer Semester as per the norms of the Summer Semesters.

20.4 Semester Grade Point Average (SGPA)

The Semester Grade Point Average is a weighted average of the grade points earned by a student in all the courses credited and describes his academic performance in a Semester. If the grade point associated with the letter grades awarded to a student are say, $g_1, g_2, g_3, \ldots\ldots\ldots\ldots$ and the corresponding weightage in credits are say, $w_1, w_2, w_3, \ldots\ldots\ldots$ the SGPA is given by:

$$\text{SGPA} = \frac{w_1 g_1 + w_2 g_2 + w_3 g_3 + \ldots\ldots\ldots\ldots}{w_1 + w_2 + w_3 + \ldots\ldots\ldots\ldots}$$

20.5. Cumulative Grade Point Average (CGPA)

1. The Cumulative Grade Point Average indicates overall academic performance of a student in all the courses registered up to and including the latest completed Semester. It is computed in the same manner as SGPA, considering all the courses (say, *n*), and is given by:

$$\text{CGPA} = \frac{\sum_{i=1}^{n} w_i g_i}{\sum_{i=1}^{n} w_i}$$

   Whenever a student is permitted to repeat or improve a course, the new letter grade replaces the old letter grade in the computation of CGPA.

Note: A student is required to complete successfully all the courses of the curriculum prescribed for the program and attain a minimum level of academic performance, by way of obtaining a minimum of SGPA/CGPA of 6.0

2. A copy of the grade card is issued to each student at the end of the Semester. The grade card of a student may be withheld if he has not paid his dues, or if there is a case of indiscipline pending against him.
3. If a student's SGPA/CGPA<6.0 in an Odd Semester, he/she will be put on 'Academic Probation'. He/she will, however, be promoted to the Even Semester during the same academic session. In case his/her SGPA/CGPA is again less than 6.0, he/she may improve by taking courses in Summer Semester, provided such courses are offered. In case the student further fails to secure the requisite CGPA, he/she will have to repeat the year. In case, such courses are not offered during the Summer Semester, the student shall have to repeat the entire Academic Year. Any student failing to attain a CGPA of 6.0 for two consecutive times will not be allowed to continue in the course.
4. In any of the cases, if a student's SGPA/CGPA<6.0 in an Odd or Even Semester, the student may take courses with a maximum of 12 credits in a Summer Semester to improve his/her CGPA≥6.0 provided such courses are offered in the Summer Semester in which the student has to improve his/her grade.
5. **Should a student's CGPA be less than 6.0 in an Academic Year, he/she has to repeat the year.**
6. 'S' and 'X' are awarded only in case of courses with zero credit: S for a pass and X for a fail in such a course. A student who is awarded an X grade in a non-credit course will be required to repeat the course.

21. PASSING A COURSE

1. A student will be declared to have passed a course provided he/she has obtained a minimum of **D** grade in the course as a whole including all the specified components of evaluation. **However the candidate must obtain a minimum of 50% of marks in CA and 30% in ESE in order to be declared pass in a course.**
2. In case a student wants to improve his/her grade point in a course, he/she can improve it only by appearing in the End Semester Examination of the same course, whenever it is offered. Scores

obtained in CA and Mid Semester Examination in the course obtained earlier shall, however remain unaltered, and shall be transferred as such for the evaluation of a fresh grade in the said course.

22. CONVERSION FACTOR FOR CONVERTING CGPA INTO MARKS EQUIVALENT

If a conversion to marks is required, the following formula may be used to calculate the same:

The Equivalent Percentage of Marks = CGPA x 8.9

%	40	45	50	55	60	70	75
CGPA	4.50	5.10	5.60	6.20	6.75	7.90	8.40

23. MAXIMUM DURATION FOR THE COMPLETION OF THE DEGREE

The maximum duration for completion of the degree, subject to other conditions, shall be as follows:

Normal Duration	**Maximum Duration Allowed**
2 Years	4 Years
3 Years	5 Years

The enrolment of the student, who fails to fulfil the requirements for the completion of the degree in the prescribed duration, shall stand cancelled and no degree will be awarded.

24. MINIMUM CGPA REQUIREMENTS FOR AWARD OF DEGREE

Unless otherwise provided, the minimum CGPA requirement for award of Degree will be as follows:

1. The minimum CGPA required for the award of a Post Graduate degree will be 6.0 and satisfying other conditions as specified in the examination ordinances/rules and Program Detail.

2.The time taken to improve the score/grade/CGPA will be counted towards the 'Maximum Duration for Completion of the Degree.

25. RESULT

25.1 Declaration of Result

The result for each Semester shall be declared within the specified period as per the provisions of the Examination Ordinances/ Rules of the University.

25.2 Semester Grade Card

1. A student will be issued a Cumulative Grade Card at the end of each Academic Year indicating the grades secured for all the registered courses up to and including the last Semester.
2. The Semester grade card of a Semester will be valid till the next card is issued in the subsequent Semester. The moment the next card is issued, the previous card stands automatically cancelled.

25.3 Withholding of Grade Card

The result of a student may be withheld if,

1. He/she has not paid all the dues, or
2. if there is a case of indiscipline or use of unfair means or of academic misconduct pending against him, or
3. for any other reason as deemed fit by the University.

25.4 Award of Degree

1. A student is deemed to have completed the requirements for the course and is eligible for award of Degree, if he/she fulfils all the requirements as mentioned in Ordinances/ Examination Rules/ Scheme and Curriculum.
2. Three divisions as defined below shall be awarded:

Division	CGPA
First	≥6.75
Second	≥ 6.0 < 6.75

25.5 Showing of Answer books

Any student desirous of seeing his/her end semester answer books can do that before the declaration of result as per university rules.

25.6. Unfair means

Cases of unfair means shall be dealt by the 'Committee on Unfair Means' as per the rules of the University. The power of interpretation of any such rules shall be with the Vice-Chancellor on the recommendations of the standing committee.

26. AWARD OF PG DIPLOMA. TO M.TECH. STUDENTS

In case a student after completing the maximum period available for the M.Tech. programme is not able to get the required minimum CGPA of 6.0 with at least 64 valid credits, then he/she can apply for a PG Diploma irrespective of whether the department/centre runs a Diploma programme or not. For the award of PG Diploma, the student must have earned a minimum of 45 valid credits with a minimum CGPA of 6.0. The request for the award of Diploma must be made within 4 years of the date of joining the programme.

27. ADDITION, DELETION, AUDIT AND WITHDRAWAL FROM COURSES

(a) **Add/Drop**: A student has the option to add a course(s) that he/she has not registered for, or drop a course(s) for which he/she has already registered for. This facility is restricted to the first week of the Semester.
(b) **Audit**: A student may apply for changing a credit course to an audit one within one week of the end of the first Mid Semester Examination.
(c) **Withdrawal**: A student who wants to withdraw from a course should apply within one week of the end of first MSE. A withdrawal grade (W) will be awarded in such cases.

Appropriate web-based applications are to be used at the academic web site from Sharda University internet for availing the above options.

28. SEMESTER WITHDRAWAL

(a) Semester withdrawal and absence for a Semester under different conditions viz. (i) medical and personal grounds, (ii) Maternity leave, (iii) industrial internship (iv) exchange / deputation to another academic institution in India or abroad, & (v) disciplinary condition should be clearly identified.

(b) Semester Withdrawal (SW) is proposed to reflect the condition in which a student is forced to withdraw from all courses in the Semester for medical conditions or for a part-time student when he/she is sent for an outstation assignment by his/her employer. A student can apply for Semester withdrawal if he /she has missed at least 20 teaching days on these grounds. Under no circumstances an application for Semester withdrawal be acceptable after the commencement of ESE. A student is not permitted to request for withdrawal with retrospective effect.

(c) Semester Leave (SL) is proposed to indicate the situation in which a student is permitted to take one or more Semester off for industrial internship or any other assignment with prior approval and planning. The application is to be routed through his/her programme coordinator and HOD and the final approving authority will be Dean. All such applications must be processed before the beginning of the Semester in which the leave will be taken. Such students are permitted maximum of two Semesters of leave. The full time 2 year M.Tech students be permitted a maximum of one Semester leave for industrial internship or other assignment as approved by the Dean.

(d) When a student registers at another academic institution in India or abroad with the expectation of credit transfer or research work through a pre-approved arrangement including MoU, the student should be considered as being on a Semester Exchange (SE). The SE period will be counted towards the total period permitted for the degree.

(e) When a student is suspended for one or more Semesters on disciplinary grounds, the student status should be called Disciplinary Withdrawal period (DW). Time spent in DW status will be counted towards the total period permitted for completion of the degree.

29. CONTINUOUS ABSENCE AND REGISTRATION STATUS

If a student, whether full time or part time, is absent from the University for more than four weeks without notifying the Head of Department/Centre or Dean, his/her registration will be terminated and name will be removed from the University rolls.

30. PART TIME STUDENTS ORDINANCES

Normally, part time M.Tech. Students are expected to complete the degree requirements in six Semesters. In case of special circumstances, including extension of dissertation work, the student can be allowed to continue beyond six Semesters but in any case he/she cannot extend registration beyond ten Semesters excluding summer Semesters.

In case of full-time students converting to part-time registration, the limit of six semesters will continue to apply.

31. FELLOWSHIPS

All the eligible full time students will get a fellowship as per notification.

32. SUMMER REGISTRATION

Summer Semester registration for PG students is admissible. M.Tech students will be allowed to register for maximum of 12 credits in the summer. For dissertation, in case **X** or **I** grade is awarded, the student would be expected to register during summer for completion of the dissertation.

33. POWER TO RELAX

Notwithstanding anything contained in these Ordinances, the Vice Chancellor/Academic Council in exceptional circumstances shall be authorized to relax any of the provisions of the said ordinances.

ORDINANCE RELATING TO AWARD OF B.TECH. DEGREE

1. GENERAL

- This Ordinance shall be called 'Sharda University Ordinance relating to award of B.Tech. Degree' and shall be applicable for the of following degrees:

  1. B.Tech. Computer Sceinces
  2. B.Tech. Information Technology
  3. B.Tech. Civil Engineering
  4. B.Tech. Mechanical Engineering
  5. B.Tech. Automobile Engineering
  6. B.Tech. Electronics and Communications
  7. B.Tech. Electrical and Electronics
  8. B.Tech. Electronics & Instrumentation
  9. B.Tech. Biotechnology

- The Ordinance shall be applicable to the students admitted to the B.Tech. programme in Academic Year 2012-13 and onwards in School of Engineering & Technology (SET) and School of Engineering (SoE)

- The students admitted through lateral entry in second year in Academic Year 2013-14 and onwards shall also be governed by the provisions of this Ordinance.

- The Academic Activities shall be held as provided in Academic Calendar released in the beginning of each Academic Year.

- The Academic Year begins in the first week of August and consists of two semesters, Odd and Even of approximately twenty weeks duration each, and a Summer semester of eight weeks.

- The situations not covered in this Ordinance shall be governed by the provisions of University Ordinances.

1.1 Definitions: In this Ordinance, unless the context provides otherwise, the;

(a) '**Executive Council'** shall mean the Executive Council of the University.

(b) '**Academic Council'** shall mean the Academic Council of the University.

(c) **'HoD'** shall mean the Head of a Department.

(d) **'Dean'** shall mean the Deans of the School of Engineering & Technology (SET) and the School of Engineering (SOE).

(e) **'CRF'** shall mean the Course Registration Form.

(f) **'FA'** shall mean the Faculty Advisor to guide the students.

(g) **'Semester'** shall mean the Semester of an Academic year, approximately of 20 weeks duration, ODD SEMESTER (first week of August to last week of December) and the EVEN SEMESTER (first week of January to the last week of May).

(h) **Summer Semester'** shall mean the Semester approximately of 8 weeks duration (first week of June to the last week of July).

(i) **'Course Credit'** shall mean the Weighted sum of the number of Lecture hours (L), Tutorial hours (T), and Practical hours (P) associated with a course.

(j) **'Registration'** shall mean the Semester wise registration for courses chosen.

(k) **'Semester Credits'** shall mean the sum of the credits of courses registered by the student in a Semester.

(l) **'Credits Earned'** shall mean the sum of credits earned through passing the course registered.

(m) **'Grade'** shall mean the qualitative assessment of the student's performance in a course indicated by the letters, A^+, A, B^+, B, C^+, C, D, FR, PP or NP Grade.

(n) **'Grade point'** shall mean the number equivalent of the letter grades; 10, 9, 8, 7, 6, 5, 4, corresponding to A^+, A, B^+, B, C^+, C, and D respectively. FR, carry zero grade points, PP, and NP do not carry any grade points.

(o) **'Concerned Teacher'** shall mean the member of faculty who teaches in a theory or a practical class.

(p) **'Semester Grade Points'** shall mean the sum of the Grade Points earned by a student in a Semester.

(q) **'SGPA'** shall mean the Semester Grade Point Average which is obtained by dividing the Semester Grade Points by the Semester Credits.

(r) **'Cumulative Credits'** shall mean sum of Credits for all the Semesters taken together.

(s) **'Cumulative Grade Points'** shall mean sum of Grade Points for all the Semesters taken together, wherein the credits of a course shall not be counted if an alternative course has been taken in lieu of it.

(t) '**CGPA'** shall mean the Cumulative Grade Point Average as obtained by dividing the Cumulative Grade Points by the Cumulative Credits.

(u) **'URA'** shall mean the Undergraduate Research Award.

(v) **'Honors'** shall mean a credential earned by a student by obtaining a requisite number of additional credits in student's own discipline.

(w) '**Minor**' shall mean a credential earned by a student by obtaining a requisite number of additional credits offered by other department(s).

(x) **'Transcript'** shall mean a consolidated statement of the Academic Performance of a student for all the Semesters completed.

(y) **'Audit course'** shall mean a course taken by a student for exposure only and carries no grade points.

2. CURRICULUM / PROGRAMME OF STUDY

2.1 Curriculum:

Every department shall follow course structure as recommended by it's Board of Studies and the Faculty Board and approved by the Academic Council of the University. The nominal requirement for each course (both theory and practical) and the course sequence shall be as prescribed in the course structure.

2.2 Semester– Odd, Even and Summer:

The B.Tech. programme shall be a Semester based programme. An Academic Year shall consist of two main and one short duration semesters:

a. Odd Semester: August to December
b. Even Semester: January to May
c. Summer Semester: June to July

Summer Semester is a fast paced short duration semester which on one hand gives the weak students a chance to clear their back-log papers, while on the other hand the bright students with a CGPA of 8.0 and above can utilize the Summer Semester to earn 24 extra credits leading to the award of "Honors" in the subjects offered by her/his own department or the award of a "Minor" in subjects offered by other departments/schools.

2.3 Academic Activities:

2.3.1 Theory and Laboratory Courses:

All the Courses are broadly classified as Theory and Laboratory Courses. Theory courses mainly consist of lectures and tutorials, while the Laboratory courses consist of practicals. A course is assigned Credits based on the number of hours of instruction per week assigned to the course, and is obtained by using a multiplier of one (**1**) for each lecture and tutorial hour, whereas, a multiplier of half (**0.5**) is assigned to each hour of a laboratory course. **For example, a theory course having three lectures and one tutorial per week throughout the semester carries 4 credits. Similarly a laboratory course having four laboratory hours per week throughout semester carries only 2 credits. While 14 lecture and tutorial hours are needed in a semester to earn one credit, 28 contact hours are needed to earn one credit in a laboratory course.**

In order to became eligible for the award of B.Tech. Degree, the students have to earn between 180 to 190 Credits, details as setout in Credit Distribution Structure for each of the department.

Other academic activities consist of Seminars, Projects, Practical Training, Work Visits and extracurricular activities, etc. While the Seminars, Projects and Summer Training (ST) carry definite credits, the extracurricular activities and the Work Visits do not carry credits.

2.3.2 Course Credit Structure:

Credits are assigned to different courses in the manner prescribed below:

(Example)

Theory course					Laboratory course				
*	L	T	P	C	*	L	T	P	C
	3	1	0	4		0	0	4	2

In the Study bulletin, if a course is shown as example **CVL304 Soil Mechanics II: 31 0 4**, and **CVL 218: Hydraulic Design Lab.: 0 0 2 2,** it will indicate the following:

	Theory course
Code	**Details**
CVL	Alphabetic code of Department (CVL is the code of Civil Engg. Department).
3	Year / Level code (3 indicates that the course is offered in the Third year)
04	Serial Number and the Semester indicator (even and odd digits indicate even and odd semester, respectively).
Soil Mechanics II	Title of the course
3 1 0 4	L T P C (credit structure)

Practical course	
Code	**Details**
CVL	Alphabetic code for Civil Engg. Department course.
2	Year / Level code (2 indicates that the course is offered in the Second year)
18	Serial Number and the Semester indicator (even and odd digits indicate even and odd semester, respectively).
Hydraulic Design Lab	Title of the course
0 0 2 2	L T P C (credit structure)

* L = Lecture; T =Tutorial; P = Practical and C = Credits

2.3.3 Seminars:

A department of the Schools shall be free to prescribe seminar(s) as an essential requirement for award of B.Tech. Degree. The student shall undertake indepth study of the topic allocated under supervision of a faculty member and shall survey the literature, critically analyse the published work, learn investigation methodology, study concepts and techniques and arrive at a conclusion. The student shall make a presentation on the report submitted before the students of the department and a panel of examiners constituted for the purpose.

2.3.4 B.Tech. Project (BTP):

Every final year student shall undertake project work as a compulsory requirement for the award of B.Tech. Degree, which entails carrying out original work under the supervision of a faculty member. The analytical capabilities and synthesis skills of a student shall be judged through the project report submitted by her/him and a presentation made by her/him before a panel of examiners.

2.3.5 Summer Training (ST):

Every students shall undergo six to eight week Summer Training in an approved Enterprise, Factory or Research Laboratory to familiarize her/him of the way an Enterprise, industrial unit or research laboratory is organised with the principles of science and engineering applied in its operation.

2.3.6 Non-Credit Requirements:

2.3.6.1 NCC / NSO / NSS / SPORTS / HOBBIES

Student can choose one of the five activities; National Cadet Corps (NCC), National Sports Organization (NSO), National Social Service (NSS), SPORTS or any of the HOBBIES offered by the university. These activities are conducted during evenings on week days and are designed for character building and/or to sensitize the students on Societal / National issues. These activities carry no credits.

2.3.6.2 Works Visit

Students will be exposed to real industry work atmosphere through Work Visits to make them understand the technology adopted in an industry. No credit is assigned for work visits.

2.4 Minimum requirement for award of B.Tech. Degree:

In order to make a student eligible for award of B.Tech. degree, the following requirements needs to be satisfied:

a) **University Requirements:** Consist of Compulsory courses, Elective courses and other requirements as approved by the Academic Council of the university from time to time.

b) **Departmental Requirements:** Consist of Compulsory courses, Elective courses and other requirements as approved by the Academic Council of the University from time to time.

A student has to earn between 180 to 190 credits (exact number of credits shall be as recommended by Board of Studies of the concerned department and approved by Faculty Board and Academic Council keeping in view the specific requirement(s) of the department) for the award of B.Tech. Degree. Broadly 90-100 credits shall be allocated for University requirements and 80-90 credits shall be allocated to Departmental requirements.

The courses shall progress as per the approved sequence and their positioning shall indiciate the maturity of a student. The student shall have to follow semester-wise schedule of courses as decided by the university from time to time.

2.5 Medium of Instruction

The medium of instruction shall be English.

2.6 Opportunities for Additional Learning:

In order to accommodate students' aspirations, abilities, interests and career goals as well as the demand of employers, The University provides the students an option to take additional courses (about 12 credits in each of the first two years) beyond the minimum programme requirement, to learn multifarious competencies that the employers desire.

The students may utilize summer semesters by opting advance specialized courses and thus enhance their academic competence. The student may choose from the courses/projects offered by their department or any other department of the School / University.

2.7 Maintenance of Discipline and Good Conduct:

Every student shall be required to maintain discipline and good conduct within and outside the University all the time. Any incidence of ragging or indiscipline shall be dealt with sternly and as per the provisions of University Ordinances.

2.8 Honors/Minors:

Honors is an additional credential that a student may be awarded if she/he earns 24 extra credits in **her/his own discipline**. The Board of Studies (BOS) of concerned department shall recommend on the courses required to be undertaken for the purpose. The students earning additional credentials equivalent to 24 credits in courses offered by other departments of the School / University shall be awarded a Minor.

All requirements for the award of a Degree as well as the Honors/Minors must be completed within the stipulated period. The students should maintain a minimum CGPA of 8.0 or more to make them eligible for grant of a Degree with Honors/Minors.

3. REGISTRATION

Registration at the beginning of semester on the dates notified in Academic Calendar is a mandatory requirement. On joining the University every student is assigned a Faculty Advisor. The students can register for courses that they intend to take during a given semester as detailed in the Study bulletin. No student shall re-register for a course(s), which she/he has already passed. **Students having outstanding dues, shall not be permitted to register.**

3.1 Procedure for Registration:

3.1.1 Online Registration:

On-line registration process involves filling up online Course Registration Form (CRF) detailing therein the courses, project and seminar etc. that the student proposes to complete during that semester. This shall be done in consultation with the Faculty Advisor.

3.1.2 Late Registration:

Only on valid reasons, late registration may be permitted till the date specified in the Academic Calendar, on payment of a late registration fee and on approval of competent authority.

3.1.3 Registration for B. Tech. Project (BTP):

Registration for B.Tech. Project (BTP) shall be done in the seventh semester. The allotment of topic and faculty supervisor shall be made by the concerned Head of Department before commencement of the seventh semester.

3.1.4 Registration for Summer Training (ST):

The registration for summer training (ST) shall begin soon after completion of the sixth semester. The Faculty Advisor / Training and Placement Cell in consultation with HoD shall arrange Summer Training. Self-arrangements made by students, shall require prior approval of HoD.

Each student on completion of Summer Training shall submit a written report, along with a certificate issued by the organization where the student has received training, within a week of the commencement of the seventh semester, to the concerned department, which will arrange its evaluation.

3. 2 Participation in Non-credit courses:

3.2.1 Participation in NCC/ NSO / NSS / SPORTS / HOBBIES

Participation in NCC/NSO/NSS/ SPORTS/HOBBIES is a not mandatory requirement. Students are expected to participate in any one of the above activities during first year.

The students may decide to continue with NSS/NSO/NCC/SPORTS/HOBBIES in subsequent years as well. This will have a mention in their transcript.

3.3 Adding/Dropping/Change of Courses:

(a) A student may add or drop course(s) within two weeks of the commencement of a semester. The student has to make an application, get the endorsement of the Faculty Advisor and Head of Department, and submit it to the Dean of the School for decision.

(b) A student may however be asked by the concerned Head of Department to drop a course at any stage if it is found that she/he does not meet the pre- requisites of the course, or if there is a clash in the student's time table preventing her/him from attending the classes, or for any other reason.

(c) In case a student has been allowed to change a course during the current term, the classes attended in the previous course shall be considered while calculating attendance to determine the eligibility for appearing in the new course ESE.

3.4 Dropping of a Semester:

a) A student in exceptional circumstances and on merits of the case may be allowed to drop an entire semester on account of severe personal health problem or unavoidable family circumstances, on advice of the Faculty Advisor, recommendation by HoD and with permission of the Dean, prior to commencement of a semester.

b) A medical certificate issued by Sharda Hospital is essential for severe health problem cases. The certificate of hospitalization issued by any other Hospital shall require

authentication by the MS, Sharda Hospital.

c) No student shall be permitted to drop a semester after the End Semester Examination.
d) Students allowed to drop a semester shall pay a semester continuation fee as prescribed.
e) Semester break can be permitted only once during the entire programme of study of a student.
f) Hostel accommodation and other facilities may be extended to a student only if available and the student meets all eligibility criteria.

4. OTHER FEATURES

4.1 Audit courses:

A student opting for an exposure to a course, may be allowed to 'audit' the course subject to the following:

i. The student must have obtained a CGPA $\geq$ 6.0.

ii. Course is being offered as a credit course for other students.

iii. 'AU' grade will be awarded only if 75% attendance is maintained. NP grade will be awarded if a student fails to maintain minimum required attendance and/or any other requirements as set out by the concerned department/the university.

iv. Audit course(s) shall not count for the award of Honors/Minors. It will, however, be reflected in the transcript.

4.2 Guided Study:

Guided Study defines opting a course outside the curriculum in self-study mode. A student having no Backlog and a CGPA of 8.0 or more, may opt for Guided study to acquire proficiency in an area of her/his choice. Guided Study, of one course per semester, subject to a maximum of four courses during the whole programme, may be permitted from IIIrd semester onwards. Registration, Examination and Evaluation for the guided study will be done in a manner as prescribed for the course opted.

The guided study may also be allowed by the Dean, in following situations:

(a) Students who miss the 'Departmental Introductory Course' due to a change of branch at the end of First year,
(b) Students who are admitted in second year as a Lateral Entry and are required to do certain additional courses.
(c) Any other situation where the dean considers it desirable.

4.3 Summer Course(s):

(a) Summer semester is a short duration fast paced semester where all the rules for the normal semester apply.

(b) The students on disciplinary probation may be allowed registration in Summer Semester with prior approval of Vice Chancellor.

(c) The list of courses offered in the Summer Semester shall be decided by the Dean in consultation with Faculty Advisors and the concerned HoD.

(d) The registration shall be limited upto a maximum of 12 credits. However, the improvement cases will not come under this credit ceiling.

(e) The Summer semester is of eight weeks duration, therefore, each course has to run at twice the normal pace.

(f) The deficient students may register for backlog courses and/or for improvement of grades on payment of prescribed fee and on approval of the Dean of the School.

(g) 75% attendance is compulsory. Students not having requisite attendance may be awarded FR grade.

(h) A minimum of 5 students should register for a particular summer course to be offered.

(i) The students obtaining F-R grade or allowed to drop a course(s), may be allowed to take up substitute course(s) subject to the following:

a. A University or Departmental Core Course cannot be substituted. The student has to complete the course in subsequent Semester(s).
b. A University Elective Course may be substituted by another elective course of the same group.
c. A Departmental Elective course may be substituted by another elective course of the same group.

(j) In view of its short duration, late registration shall not be permitted in summer semester.

5. EXAMINATION / ASSESSMENT

Unless otherwise provided in course details, the following shall be the components of evaluation:

(a) Continuous Assessment (CA)
(b) Mid-Semester Tests (MSTs) and
(c) End-Semester Examination (ESE).

5.1 Evaluation for Theory Courses:

1. The students' performance in a theory course shall be evaluated through Continuous Assessment (CA) consisting of Quizzes, Class tests, Home assignments, Group assignments, Viva-voce; Mid-Semester Examinations (MSEs) and End-Semester Examination (ESE). The CA component shall have a minimum of three quizzes along with assignments and viva-voce. Two MSEs of 60 minutes duration shall be held as per the schedule fixed in Academic Calendar. Relative weightage for CA, MSE and ESE shall be in the ratio of 30:20:50. The Class tests/ Quizzes/ Multiple choice Question tests/ Group discussions/ Debates/ Case studies/ Field studies/ Group activities, etc., shall be conducted by the faculty members as per the course plan and shall be monitored by Head of Department.

The component of Continuous Assessment in theory courses shall have following weightage:

i.	Quizzes/Debates/Case Studies	9 Marks
ii.	Attendance	*5 Marks
iii.	Presentations/ Group Activities	10 Marks
iv.	Assignments	6 Marks

* > 90%-5; 85-<90% - 4; 80-<85% - 3; 75-<80% - 2; 70-<75% -1(in case of approved absence)

2. The End-Semester Examination will be held on the dates notified in Academic Calendar. It's duration is normally 3 or 2 hours and covers full syllabus of the course. The End Semester Examination is mandatory. Students not appearing in the End Semester Examination will be awarded 'F' Grade. A student must secure a minimum of 'D' grade in End Semester Examination.

5.2 Evaluation for Laboratory Courses:

The assessment in laboratory courses shall be based on students involvement in practicals, quality of practical records maintained, performance in viva-voce and group discussions and a Semester-end Test, which may contain a laboratory practical and/or a written examination. The in-Semester work and the Semester-end Test will carry a weightage of 60:40.

5.3 Evaluation of Seminars:

Seminars are evaluated based on the paper submitted and oral presentation made before a panel of experts/examiners appointed by the Controller of Examinations. The supervisors shall also be the members of the panel. Grade points are awarded based on quality of written submission, presentation and performance in the question answer session that may follow the presentation.

5.4 Evaluation for Projects (BTP) and Summer Training (ST):

5.4.1 B. Tech. Project (BTP)

BTP is a mandatory requirement for the award of degree. The Student has to defend the project report before a panel of examiners. The dates for submission of project report, date of presentation and mode of assessment shall be as decided by the department concerned.

5.4.2 Summer Training (ST)

The Summer Training will be evaluated based on the report submitted by the student and the viva-voce conducted by the department. The exercise shall generally conclude within two weeks of commencement of VIIIth semester.

5.5 Grading:

5.5.1 Grading systems

The students are awarded letter grades based on 10 point scalen on the combined performance in the assessment for each course, BTP, ST etc. The grades besides indicating qualitative assessment of the student's performance also carry a quantitative (numeric) equivalent called the Grade Point. In situations where number of students is less than or equal to 45, Absolute Grading system is followed and where the number of students is more than 45, Relative Grading system is resorted. The grade point system shall be as given below:

(a) Absolute Grading System

Letter Grade	Grade Point	Description	Range of percentage of marks (%)
A^+	10	Outstanding	>90 and ≤ 100
A	09	Excellent	>80 and ≤ 90
B^+	08	Very good	>70 and ≤ 80
B	07	Good	>60 and ≤ 70
C^+	06	Average	>50 and ≤ 60
C	05	Below Average	>40 and ≤ 50
D	04	Marginal	>30 and ≤ 40
F-R	0 (Fail- Repeat the course)	Very poor	<= 30

(b) Relative Grading system

Letter Grade	Grade Point	Description	Range of percentage of marks (%)
A^+	10	Outstanding	S **>** M + 1.5σ (alongwith a minimum score of 90%)
A	09	Excellent	M + 1.0σ < S <= M + 1.5σ
B^+	08	Very good	M + 0.5σ < S <= M + 1.0σ
B	07	Good	M < S <= M + 0.5σ
C^+	06	Average	M - 0.5σ < S <= M
C	05	Below Average	M - 1.0σ < S <= M - 0.5σ
D	04	Marginal	M - 1.5σ < S <= M -1.0σ
F-R	0 (Fail- Repeat the course)	Very poor	S<= M -1.5σ

S - Marks secured by the individual student
M - Mean of marks obtained by all the students in the class who appeared in the ESE.
σ - Standard Deviation for the class.

Notwithstanding the above ranges, a student securing < 30% marks shall be awarded F-R grade, student securing < 90% marks shall be awarded a maximum of A grade only.

5.5.2 Applicable Grading System

The Laboratory Courses and Seminars shall be graded through Absolute Grading system irrespective of the number of students in the class.

5.5.3 Grading in Audit Courses

The audit courses shall be awarded following grades:

Grade Point	Letter Grade
Audit	AU
Pass	PP
Not Pass	NP

5.6 Academic Malpractice

Academic malpractices as defined in University Ordinance shall be severely dealt with as per the provisions of University Ordinances.

5.7 Grade Point Average (SGPA/CGPA):

5.7.1 Semester Grade Point Average (SGPA):

The SGPA is the weighted average of the grade points obtained in all registered courses during a semester. For example, if a student registered in five courses (Theory/labs./Projects/ Seminar etc.) carrying C1, C2, C3, C4 and C5 credits has earned g1, g2, g3, g4 and g5 grades respectively, shall have a SGPA computed as under:

$$SGPA = \frac{C1g1 + C2\,g2 + C3\,g3 + C4\,g4 + C5\,g5}{C1 + C2 + C3 + C4 + C5}$$

The SGPA shall be calculated to two decimal places.

The SGPA for a student awarded FR grade (zero) in course C4 (for example), shall be computed as under:

$$SGPA = \frac{C1g1 + C2\,g2 + C3\,g3 + C_4*ZERO + C5\,g5}{C1 + C2 + C3 + C4 + C5}$$

The course not a part of the minimum requirement for the award of degree, **shall not be considered in calculation of SGPA** and will be shown separately.

5.7.2 Cumulative Grade Point Average (CGPA):
CGPA, up to date of assessment of the overall performance of a student, is calculated in a manner similar to that of SGPA calculations. The CGPA indicates Cumulative performance in all the course registered till that date.

The CGPA includes failed status. However, when a course(s) is/are cleared by obtaining a pass grade, CGPA will reflect the new grade.

The semester grade point for a student registered for **n** courses, having an "FR" grade in course **i** shall be computed as under:

$$CGPA = \frac{C1g1 + C2\,g2 + C3\,g3 + ..+ C_i*ZERO + ..+ Cn\,gn}{C1 + C2 + C3 + ...+ Ci + \ldots + Cn}$$

For a student who fails in a course more than once, the course will figure only once in numerator as well as the denominator.

At the end of a semester when a student clears backlog, the CGPA shall be computed as under:

$$CGPA = \frac{C1g1 + C2\,g2 + C3\,g3 + ..+ C_igi* + ..+ Cn\,gn}{C1 + C2 + C3 + ...+ Ci + \ldots + Cn}$$

The courses not forming part of the minimum requirement for award of degree will not be considered for calculation of CGPA and will be shown separately.

Note-

1. If a student's SGPA <5.5 in an Odd Semester, he/she will be placed on 'Academic Probation' and promoted to the Even Semester. In case his/her CGPA is less than 5.5, he/she may improve by taking courses in Summer Semester, provided such courses are offered. The student failing to secure the requisite CGPA, he/she will have to repeat the year. Any student failing to attain a CGPA of 5.5 for two consecutive times will not be allowed to continue in the course.

5.7.3 Conversion of Grade to Marks: The following formula may be used for converting CGPA to marks where required:

Percentage of Marks = CGPA x 8.9

%	40	45	50	55	**60**	70	75
CGPA	4.50	5.10	5.60	6.20	**6.75**	7.90	8.40

5.7.4 Semester Grade Report:
At the end of each Semester, the Semester grade report, reflecting the performance of the student in that Semester, is issued. The report includes the fail grade(s) as awarded. When a failed course is cleared, a new modified grade report shall be issued.

5.7.5 Transcript:
On successful completion of the programme a consolidated statement of the performance shall be issued along with the degree certificate. The transcript for the students taking multiple attempts to clear a course, shall contain earned pass grade (A^+-D, PP), the course shall however be shown in the semester in which the student has finally cleared it. The overall CGPA shall also be reflected in the transcript. Additional courses shall however be shown separately, indicating also the Honours/ Minor, as earned.

5.8 Display of In-Semester marks:

The marks awarded in CA shall be made available to the students by the concerned teacher. Those awarded "F" grades will be identified clearly in this list.

5. 9 Evaluated Answer Scripts of End-Semester Examination:

Students desirous of seeing their End Semester answer books can do so before the declaration of result and on the dates as may be notified by the concerned teacher.

5.10 Answer Script Retention period:

Evaluated answer scripts shall be preserved by the Examination Cell for a minimum period of one year from the date of declaration of result for the relevant semester.

5.11 Attendance:

Students are expected to maintain 100% attendance. However, on account of ill-health or other exigency situations, absence up to 25% may be considered on case to case basis and on production of documentary proof. A student having less than 75% attendance shall be debarred from appearing in the End-Semester examination and awarded "F" grade. Such a student will have to re-register for the same course in subsequent semester(s). The attendance requirement is applicable to summer courses too. A relaxation of up to 10 % in attendance, over and above 25%, can be given by the Dean in exceptional circumstances and on the merit of individual case.

6. CHANGE OF BRANCH

Students are eligible to apply for change of Branch after completing the first two Semesters subject to the following:

(a) Completion of the credit requirement prescribed for first two Semesters;
(b) No backlog at the end of first year, and
(c) Securing a CGPA of 8.0 or above.

6.1 A student will be permitted to change from branch A to branch B, strictly in CGPA order, provided the strength in branch B, to which the change is being sought, does not exceed its sanctioned strength.

The Branch transfers shall be allowed only once. The formalities for Branch change shall be completed before the beginning of registration for second Academic year. No application for change of branch during the subsequent Academic years shall be entertained.

7. AWARDS

7.1 Award of the degree

On successful completion of the prescribed requirements for the B. Tech. programme, the degree will be awarded and conferred in Annual Convocation. In cases where required credits for Honors in own discipline or a Minor in another discipline have been earned by a student, a mention will be made in the degree awarded.

A degree will be awarded only if the student has;

a) Successfully completed the requirements of minimum credits and has obtained a minimum CGPA of 5.5.
b) Paid all the University dues.
c) No case of indiscipline pending against her/his name.

7.2 Award of Medals:

The Chancellor's Medal is awarded at the University level to the top student of graduating batch. In addition a Gold Medal is awarded to the position holder in every School. The three top position holders in every branch will be awarded merit certificates.

8. UNDERGRADUATE RESEARCH AWARDS (URA)

In order to promote research amongst the B.Tech. students, Undergraduate Research Awards (URA), shall be granted at two levels:

URA01:	For preliminary research/ developmental experience
URA02:	For B. Tech. Level Research Project.

9. MISCELLANEOUS

9.1 Faculty Advisor

On joining the University, a Faculty Advisor is assigned to every student. The students have to consult the Faculty Advisor on course selection and other academic matters/problems. The Faculty Advisor shall try to guide the student on day to day basis to help her/him to successfully complete requirements for award of degree. **The parents/guardians may seek performance related information about their ward from the Faculty Advisor.**

A Faculty Advisor shall:

1. **apprise the students of the rules and regulations leading to award of a degree.**
2. **advise the students in course registration as per the curriculum and the university ordinances.**
3. **recommend approval of registration.**
6. **pay special attention to weak students and carefully monitor their performance.**
7. **advice students on Course Adjustment / Dropping of courses during the Semester.**
8. **liaison with parents of the students.**
9. **update student on Academic Administration of the University.**

10. POWER TO RELAX

Notwithstanding anything contained in this Ordinance, the Executive Council shall have authority to relax any of the provisions of the said Ordinance in extra-ordinary situations.

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Annexure-XIII of Agenda Item no. 6.12

BBA Course and Credit Structure (Session: 2012-2015) - *Revised*

FUNCTIONAL AREA	TERM I		TERM II		TERM III		TERM IV		TERM V		TERM VI		
	Module	Cr	Module	Cr	Module	Cr	Module	Cr	Module	Cr	Module	Cr	
Marketing	Marketing Management	4	Marketing Research	4	Services Marketing	4	Marketing strategy	4					
Statistics & Operation Research	Business Statistics	4			Operations Research	4	Production and Operations Management	4	Supply chain Management	4			
Economics	Business Economics	4	Economic Environment of Business	4			International trade and policy	4					
Human Resource			Organizational Behaviour	4	Human Resource Management	4			Team building and Leadership	4			
Accounting and Finance	Financial accounting	4	Cost and Managerial Accounting	4	Financial Management	4	Financial Markets and Institutions	4					
Information Technology	Fundamentals of Computer applications	4			Management Information System	4			E-Business	4			
Law			Business Law	4			Corporate Law	4					
General Management	Management Concepts	4							Global business environment	4	Strategic Management	4	
											Entrepreneurship and New Business	4	
Communication	Language and Communication	2	Foreign Language	2	Business Communication -I	2	Foreign Language	2	Business Communication -II	2			
Specializations									2 Modules from BBA specialization	8	2 Modules from BBA specialization	8	
Projects & viva voce			Comprehensive viva voce	2	Comprehensive viva voce	2	Comprehensive viva voce	2	Summer Training Evaluation	4	Research Report	4	
											Comprehensive Viva-Voce	2	
TOTAL		**26**		**24**		**24**		**24**		**30**		**22**	**150**

**** BBA - Areas of Specialization**

Sl. No.	Areas ^
1	Human Resource Management
2	Marketing
3	Finance
4	International Business

^ *only one to be opted*

Subjects of each specialization areas:

INTERNATIONAL BUSINESS	**MARKETING**
International Finance and Foreign Exchange Management	Retail Management
International Aspects of Business Operations	Advertising and Brand Management
Globalizing Indian Business	Sales and Distribution Management
International Market Development	Rural Marketing
BANKING AND FINANCE	**HUMAN RESOURCE MANAGEMENT**
Business Taxation	Industrial Relations
Fundamentals of Investment Management	Training and Development
Financial Services	International and Strategic HRM
International Finance	Cross Cultural Issues

Master of Business Administration (MBA) – Banking and Finance

Term 1	Cr	Term 2	Cr	Term 3	Cr	Term 4	Cr	Term 5	Cr	Term 6	Cr
C-101 FINANCIAL ACCOUNTING & ANALYSIS	3	C-201 COST & MANAGEMENT ACCOUNTING	3	C-301 FINANCIAL MANAGEMENT & CONTROL	3	C-401 GLOBALIZATION, PUBLIC AND BUSINESS POLICY AND LAWS	3	C-501 STRATEGIC MANAGEMENT AND IMPLEMENTATION IN RETAIL	3	C-601 INTERNATIONAL BANKING	3
C-102 MANAGEMENT PROCESS & ORGNISATIONAL BEHAVIOUR	3	C – 202 TEAM BUILDING, LEADERSHIP & CHANGE MANAGEMENT	3	C-302 HUMAN RESOURCE MANAGEMENT	3	-		C-502 TECHNOLOGY IN BANKING, CRM AND RETAIL BANKING	3	C-602 INTERNATIONAL FINANCIAL MANAGEMENT	3
C-103 MARKETING MANAGEMENT	3	C-203 MARKETING RESEARCH	3	C-303 MARKETING STRATEGIES	3	C-402 PRINCIPLES AND PRACTICE OF BANKING	3	C-503 TREASURY OPERATIONS AND RISK MANAGEMENT	3	-	
C-104 QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS	3	C-204 OPERATIONS RESEARCH	3	C-304 PRODUCTION, OPERATIONS MANAGEMENT & TQM	3	C-403 REGULATORY FRAMEWORK FOR FINANCIAL & BANKING SECTOR	3	C-504 PROJECT FINANCE AND MANAGEMENT	3	C-603 SUPPLY CHAIN MANAGEMENT	3

C-105 MANAGERIAL ECONOMICS	3	C-205 BUSINESS ENVIRONMENT	3	C-305 INTERNATIONAL BUSINESS	3	C-404 SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT	3	DISERTATION HYPOTHESIS DEVELOPMENT	3	REPORT PRESENTATION AND VIVA	4	
C-106 IT & MIS	3	C-206 BUSINESS LAWS	3	C-306 STRATEGIC AND TRANSFORMATIONAL IT (ERP)	3	C-405 SUMMER TRAINING REPORT AND PRESENTATIONS	3	-		-		
C-107 BUSINESS COMMUNICATION-I	3	C-207 BUSINESS COMMUNICATION - II	3	C-307 BUSINESS ETHICS AND CORPORATE GOVERNANCE	3	C-405 WORKSHOP-ON FOREIGN LANGUAGES	1	-		-		
C-108 WRITTEN ANALYSIS CASES (WAC)	1	C-208 WORKSHOP-FOREIGN LANGUAGE	1	C-308 WORKSHOP-FOREIGN LANGUAGE	1	-		-		-		
TOTAL	**22**		**22**		**22**		**16**		**15**		**13**	**110**

Master of Business Administration (MBA) – Retail Management

Term 1	Cr	Term 2	Cr	Term 3	Cr	Term 4	Cr	Term 5	Cr	Term 6	Cr
C-101 FINANCIAL ACCOUNTING & ANALYSIS	3	C-201 COST & MANAGEMENT ACCOUNTING	3	C-301 FINANCIAL MANAGEMENT & CONTROL	3	C-401 GLOBALIZATION, PUBLIC AND BUSINESS POLICY AND LAWS	3	C-501 STRATEGIC MANAGEMENT AND IMPLEMENTATION IN RETAIL	3	C-601 CUSTOMER RELATIONSHIP MANAGEMENT AND COMMUNICATION	3
C-102 MANAGEMENT PROCESS & ORGNISATIONAL BEHAVIOUR	3	C – 202 TEAM BUILDING, LEADERSHIP & CHANGE MANAGEMENT	3	C-302 HUMAN RESOURCE MANAGEMENT	3	-		C-502 RETAIL MARKETING: BUILDING RETAIL BRANDS	3	C-602 FINANCIAL MANAGEMENT OF RETAIL SECTOR	3
C-103 MARKETING MANAGEMENT	3	C-203 MARKETING RESEARCH	3	C-303 MARKETING STRATEGIES	3	C-402 UNDERSTANDING RETAIL ORGANIZATION AND E-BUISINESS	3	C-503 PACKAGING, ASSORTMENT PLANNING AND BUYING	3	-	
C-104 QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS	3	C-204 OPERATIONS RESEARCH	3	C-304 PRODUCTION, OPERATIONS MANAGEMENT & TQM	3	C-403 MERCHANDISING, CATEGORIZATION, STORE LAYOUT & PRESENTATION	3	C-504 PRICING, SELLING & RETAIL PROMOTIONS	3	C-603 SUPPLY CHAIN MANAGEMENT	3
C-105 MANAGERIAL ECONOMICS	3	C-205 BUSINESS ENVIRONMENT	3	C-305 INTERNATIONAL BUSINESS	3	C-404 SHOPPERS AND RETAIL CONSUMERS	3	DISERTATION HYPOTHESIS DEVELOPMENT	3	REPORT PRESENTATION AND VIVA	4
C-106 IT & MIS	3	C-206 BUSINESS LAWS	3	C-306 STRATEGIC AND TRANSFORMATIONAL IT (ERP)	3	C-405 SUMMER TRAINING REPORT AND PRESENTATIONS	3	-		-	
C-107 BUSINESS COMMUN	3	C-207 BUSINESS COMMUNI	3	C-307 BUSINESS ETHICS	3	C-405 WORKSHOP-ON	1	-		-	

ICATION-I		CATION - II		AND CORPORATE GOVERNANCE		FOREIGN LANGUAGES						
C-108 WRITTEN ANALYSIS CASES (WAC)	1	C-208 WORKSHOP-FOREIGN LANGUAGE	1	C-308 WORKSHOP-FOREIGN LANGUAGE	1	-		-		-		
TOTAL	**22**		**22**		**22**		**16**		**15**		**13**	**110**

Annexure-XIV-C of item no. 6.13

Master of Business Administration (MBA) – Consulting Services

Term 1	Cr	Term 2	Cr	Term 3	Cr	Term 4	Cr	Term 5	Cr	Term 6	Cr
C-101 FINANCIAL ACCOUNTING & ANALYSIS	3	C-201 COST & MANAGEMENT ACCOUNTING	3	C-301 FINANCIAL MANAGEMENT & CONTROL	3	C-401 GLOBALIZATION, PUBLIC AND BUSINESS POLICY AND LAWS	3	C-501 STRATEGIC MANAGEMENT AND IMPLEMENTATION IN CONSULTING	3	C-601 INTERNATIONAL FINANCE AND BUSINESS ANALYTICS – SAS TOOLS	3
C-102 MANAGEMENT PROCESS & ORGNISATIONAL BEHAVIOUR	3	C – 202 TEAM BUILDING, LEADERSHIP & CHANGE MANAGEMENT	3	C-302 HUMAN RESOURCE MANAGEMENT	3	-		C-502 CONSULTING PROCESSES, TOOLS AND PRACTICES	3	C-602 BUSINESS PROCESS REENGINEERING	3
C-103 MARKETING MANAGEMENT	3	C-203 MARKETING RESEARCH	3	C-303 MARKETING STRATEGIES	3	C-402 CONSULTING – CONCEPTS AND SERVICES	3	C-503 PROJECT APPRAISAL AND MANAGEMENT	3	-	
C-104 QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS	3	C-204 OPERATIONS RESEARCH	3	C-304 PRODUCTION, OPERATIONS MANAGEMENT & TQM	3	C-403 CONSULTING AND PROFESSIONAL PRACTICES	3	C-504 ACQUISITION & MERGERS AND VALUATION	3	C-603 KNOWLEDGE MANAGEMENT AND TRIPS	3
C-105 MANAGERIAL ECONOMICS	3	C-205 BUSINESS ENVIRONMENT	3	C-305 INTERNATIONAL BUSINESS	3	C-404 DEVELOPING CONSULTING SKILLS AND RESEARCH METHODS	3	DISERTATION HYPOTHESIS DEVELOPMENT	3	REPORT PRESENTATION AND VIVA	4
C-106 IT & MIS	3	C-206 BUSINESS LAWS	3	C-306 STRATEGIC AND TRANSFORMATIONAL	3	C-405 SUMMER TRAINING REPORT AND PRESENT	3	-		-	

				IT (ERP)		ATIONS						
C-107 BUSINESS COMMUNICATION-I	3	C-207 BUSINESS COMMUNICATION - II	3	C-307 BUSINESS ETHICS AND CORPORATE GOVERNANCE	3	C-405 WORKSHOP-ON FOREIGN LANGUAGES	1	-		-		
C-108 WRITTEN ANALYSIS CASES (WAC)	1	C-208 WORKSHOP- FOREIGN LANGUAGE	1	C-308 WORKSHOP- FOREIGN LANGUAGE	1	-		-		-		
TOTAL	**22**		**22**		**22**		**16**		**15**		**13**	**110**

Annexure-XIV-D of item no. 6.13

Master of Business Administration (MBA) – Security and Intelligence Management

Term 1	Cr	Term 2	Cr	Term 3	Cr	Term 4	Cr	Term 5	Cr	Term 6	Cr
C-101 FINANCIAL ACCOUNTING & ANALYSIS	3	C-201 COST & MANAGEMENT ACCOUNTING	3	C-301 FINANCIAL MANAGEMENT & CONTROL	3	C-401 GLOBALIZATION, PUBLIC AND BUSINESS POLICY AND LAWS	3	C-501 INTERNATIONAL SECURITY & TERRORISM	3	C-601 INTRODUCTION TO FORENSICS	3
C-102 MANAGEMENT PROCESS & ORGNISATIONAL BEHAVIOUR	3	C – 202 TEAM BUILDING, LEADERSHIP & CHANGE MANAGEMENT	3	C-302 HUMAN RESOURCE MANAGEMENT	3	-		C-502 CYBER LAWS & CYBER SECURITY	3	C-602 DATA PROTECTION, ENTERPRISE IDENTITY & ACCESS	3
C-103 MARKETING MANAGEMENT	3	C-203 MARKETING RESEARCH	3	C-303 MARKETING STRATEGIES	3	C-402 INTELLIGENCE GATHERING AND ANALYSIS	3	C-503 ELECTRONIC SECURITY SYSTEM	3	-	
C-104 QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS	3	C-204 OPERATIONS RESEARCH	3	C-304 PRODUCTION, OPERATIONS MANAGEMENT & TQM	3	C-403 SECURITY AND RISK MANAGEMENT	3	C-504 INTRODUCTION TO INFORMATION WARFARE	3	C-603 SYTEM ANALYSIS AND APPLIED COMMUNICATION	3
C-105 MANAGERIAL ECONOMICS	3	C-205 BUSINESS ENVIRONMENT	3	C-305 INTERNATIONAL BUSINESS	3	C-404 INDUSTRIAL SECURITY & SECURITY OPERATIONS	3	DISERTATION HYPOTHESIS DEVELOPMENT	3	REPORT PRESENTATION AND VIVA	4

C-106 IT & MIS	3	C-206 BUSINESS LAWS	3	C-306 STRATEGIC AND TRANSFORMATIONAL IT (ERP)	3	C-405 SUMMER TRAINING REPORT AND PRESENTATIONS	3	-		-		
C-107 BUSINESS COMMUNICATION-I	3	C-207 BUSINESS COMMUNICATION - II	3	C-307 BUSINESS ETHICS AND CORPORATE GOVERNANCE	3	C-405 WORKSHOP-ON FOREIGN LANGUAGES	1	-		-		
C-108 WRITTEN ANALYSIS CASES (WAC)	1	C-208 WORKSHOP-FOREIGN LANGUAGE	1	C-308 WORKSHOP-FOREIGN LANGUAGE	1	-		-		-		
TOTAL	**22**		**22**		**22**		**16**		**15**		**13**	**110**

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Annexure-XIV-E of Agenda Item no. 6.13

Course Contents

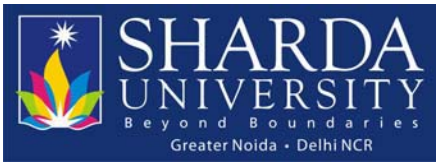
For

Term I, II, III

(Trimester Based Programmes)

- MBA - Banking and Finance
- MBA - Retail Management
- MBA - Consultancy Management
- MBA - Security and Intelligence Management

SCHOOL OF BUSINESS STUDIES



SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title: **Financial Accounting & Analysis**
Program: **MBA (Trimester)**
Term: **I**
Credits: **3**

Time required in terms of Student Learning:

Learning	Hours
Contact	**25**
Guided Study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Module Aim

The aim of Accounting is to provide the opportunity for students to develop a basic understanding of the accounting cycle and to develop an awareness and understanding of how accounting concepts interpret and influence our economy. This course is designed to introduce the subject of accounting to undergraduate management students.

Teaching and Learning Approach

Guided Study

Guided study will include text readings, articles on contemporary issues in organization, assignments, case analysis and power point presentations.

Assessment

Assessment of the student will be based on mid-term and end term examination and continuous assessment subject to class participation, assignments and presentations.

Indicative Content

Following set of topic will help to achieve the learning outcomes.

Topic	Covers:	Sessions
Introduction to Accounting	Meaning, need, scope, and functions of accounting. Basic accounting terms- Asset, liability, capital, expense, income, expenditure, revenue, debtors, creditors, goods, cost, stock, purchases, discount, and drawings.	**3**
Theory base of Accounting	Accounting principles, Accounting concepts and Accounting conventions.	**2**
Mechanics of Accounting	Journalizing transactions: Rules of debit and credit, Journal entry. Ledger Posting and Trial Balance, Subdivision of journal-cash book, proper journal.	**4**

Final accounts	Preparation of Trading account, Profit and Loss Account and Balance Sheet with adjustments	**4**
Ratio Analysis	Concept, types and importance of ratio analysis. Du-pont Analysis, Common Size Statement, Comparative Balance Sheet	**8**
Cash Flow Analysis	Meaning of Cash Flows, Preparation of Cash Flow Statements	**4**

Recommended Text:

1. Fundamentals of Accounting- V.P. Patti, Excel Books.
2. Financial accounting-R.S.Singhal (Anand)
3. Fundamental of financing accounting- Ashok (Taxmann)
4. An Introduction to Accountancy- S.N. Maheshwari and S.K. Maheshwari, Vikas Publishing House Pvt. Limited.
5. Financial accounting-Needles-(Cengage)

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : Quantitative Techniques for Business Decisions
Program : MBA (Trimester)
Term : 1
Credits : 3

Time required in terms of Student Learning:

Learning	Hours
Contact	**25**
Guided Study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Module Aim

To provide the students with an adequate understanding of some of the important quantitative techniques and applications in business. This knowledge helps in using diagnostic and analytical methods based on statistics for better managerial decision-making.

Teaching and Learning Approach

The course will be delivered through lectures, discussions and analysis, cases and applications, exercises and designed to develop skills in analytical ability.

Indicative Content:

Topic	Coverage	No. of Lectures
Introduction	• Meaning of quantitative techniques • Meaning & Scope of statistics • Collection & Presentation of data Frequency distribution	3
Measures of Central Tendency, Variation and Skewness	• Central value and their applications in business • Standard deviation & Coefficient of variation • Skewness & Coefficient of Skewness	4
Theory of Probability	• Meaning and relevance to managerial decision-making • Basic rules of Probability Baye's Theorem & its applications	4
Probability Distributions	• Mathematical Expectation • Binomial Distribution • Poisson Distribution • Normal Distribution	4
Correlation & Regression	• Linear Correlation • Scatter Diagram • Coefficient of correlation • Rank correlation coefficient Linear Regression	4

Tests of Hypothesis	• Meaning & purpose of tests of hypothesis • Various steps involved in testing of hypothesis • Two-tailed and one-tailed tests • Z-test • t-test and F-test • Chi-square test	6

Suggested Readings:

- Statistics for Management by Richard I. Levin and David S. Rubin, 2010 Edition, Prentice-Hall of India, New Delhi
- Business Statistics by M.P. Gupta and S.P. Gupta, Fifteenth 2010 Edition, Sultan Chand & Sons, New Delhi.
- Statistics for Managers using Microsoft Excel by David M. Levine, David Stephan, Timothy C. Krehbiel and Mark L. Berenson, Fourth Edition 2010, Pearson Education, New Delhi.
- Business Statistics by Naval Bajpai, Pearson.

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : IT & Management Information System
Program : MBA (Trimester)
Term : I
Credits : 3

***Time required in terms of Student Learning*:**

Learning	Hours
Contact	**25**
Guided Study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Aim and Objective:
The objective of this course is to help Business Management students learn how to use and manage information technologies to revitalize business processes, improve managerial decision-making and gain competitive advantage. The course will equip students with the information necessary to become specialists in tomorrow's fast changing and dynamic business world.

After completing this course, the students will be able to understand the concepts of M I S in an elaborate form . They will be able to have the basic idea and basic concept of DBMS &IT

Teaching and Learning Approach:
Students will learn through a combination of face-to-face contact and guided study. Personal contact sessions will include case study analysis, simulation exercises, numerical problem solving, and presentations. Guided study will include preliminary text readings (defined by lecturer). Additional material will also be emailed by presenters.

Guided Study:

Guided study will include text readings, articles on contemporary issues in organization, assignments, case analysis and power point presentations.

Assessment:

Assessment of the student will be based on mid-term and end term examination and continuous assessment subject to class participation, assignments and presentations.

Indicative Content:
Following set of topic will help to achieve the learning outcomes.

Topic	Coverage	No. of Lectures	Presentation	Case study
Introduction of Information Systems	• Concepts and framework of Information System • Operational and Managerial Level Information Systems • ESS, DSS, MIS, TPS • Benefits of Information System • Systems Approach to Problem-Solving	**5**	**Yes**	
Information System Planning	• Internet and Business • Fundamentals of E-Commerce • Information System Planning by Nolan Stage Model • Transaction Processing Systems	**5**	**Yes**	
Decision Support System	• Evolution of DSS • Characteristics of DSS	**5**		**Yes**

	• Simon's Model of Decision Making • Components of Decision Making • Role of MIS in Decision-Making			
Protecting Information System	• Major Security Threats • Security Technology- Digital Signatures , Firewalls , Digital Certificates • Disaster Recovery Plan • Biometric Controls • Authorization	**5**	**Yes**	
Database Technology within Business	• Introduction to Concept of Database System • Features and Advantages of Database System • Data Abstraction and Data Independence • Database Approach to Enterprise Management • Basics of Data Models in Designing Schema	**5**	**Yes**	
TOTAL		**28**		

Recommended Reading:

1) Laudon & Laudon, "***Management Information System***" Prentice Hall, 11th Edition (2008)
2) RajanaranianV, "***Analysis and Design of Information System***" Prentice Hall, 2nd Edition (2002)
3) D.P.Goyal, "***Management Information Systems & Managerial Perspective***" Macmillan India Ltd., 2nd Edition (2007)
4) Navathe/ Elmasri, "***Fundamentals of Database Management System***" Pearson 4th Edition (2004)
5) Judith Hurwitz , "***Service Oriented Architecture for Dummies***" Wiley Publishing Inc. (2007)

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : **Business Communication**
Programme : **MBA (Trimester)**
Term : **I**
Credit : **3**

Time required in terms of Student Learning:

Learning	Hours
Contact	**25**
Guided study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Introduction

"Business Communication" is evolving with a rapid pace with the introduction of the new network based collaborative technologies. As a result of global completion and restructuring, we are witnessing dramatic changes in work environments. The main focus of this course is to provide students with adequate exposure to various forms and practices of business Communication.

In "Written Analysis of Cases "students need two distinct sets of skills. First, they need to be able to analyze a case, to give it meaning in relation to its key issues or questions that have been asked about it. The goal is to come to conclusions congruent with the reality of the case, taking into account its gaps and uncertainties. Second, students have to be able to communicate their thinking effectively.

Pedagogy

The course is ***not*** structured in a traditional lecture format, rather students at the end of the course develop the ability to seek out needed material to analyze and resolve business issues that they may encounter in their professional lives. Students are given cases to analyze and write analytical reports. Detailed written feedback is given to all students; this is supplemented by common oral feedback. Classroom sessions augment the thinking process; strengthen the process of integration and logical thinking. Students also develop the capability of written business communication, in all the Management functional domains.

Topic	Coverage	No. of Lectures
Principles of Communication	Introduction, Process, Turn-Taking, Network, 7C's and 7s's.	4
Mechanics of Writing	Stages, Notes, Compose Business Messages, Style and Tone, Punctuation, Redundancies, Proof Reading	4
Report Writing	Five W's and 1 H, Report Planning, Types of Reports, Developing an outlining, Nature of Headings, Point Formulation, Divisions, Numbering, Visual Aids.	4
Sections of Report	Introduction,Title, Acknowledgements, Contents, Illustrations, Executive Summary, Abstract, Introduction, Text, Terminal Section, End matter.	4
Circulars, Notices, Memos, Agenda, Minutes		3

Letters		2
Applying for a Job	Introduction, Solicited and Unsolicited letters, Curriculum Vitae, Resume, Filling Employment Applications	4

Learning Outcomes

This course reflects situations that the students may face as a professional and will deepen their UNDERSTANDING AND EFFECTIVE USE of the written and oral skills and tools learnt so far.Developing communication briefs related to specific situations or events within an organization.

Evaluation

Class Participation - 10 %
Quiz - 10%
Assignment - 20%
Mid Term - 20%
End Term- - 40%

Collaboration with fellow students: Discussion with fellow students will help you gain insight into different aspects of the managerial problems you have to solve . We encourage you to do so before writing your assignments. **But the writing should be strictly you own.** It is in your own interest to ensure that your report is a product of your independent thinking and writing, and that you do not write with others. Do not copy from others or from any other sources such as the Internet or reports written by former students or from other courses. Also, do not let anyone else copy your report either. If we come across any instance of copying or attempt at cheating, we will treat it very seriously.
Let's focus on doing a good job and learning the craft of report writing. The skills you acquire through Business Communication are going to support you well for years to come.

Essential Readings:

1. Business Communication Today, Bovee, Thill, Schatzman
2. Business Communication, Mary Allen Guffy
3. Business Communication, Mary Munter

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : Management process & organizational behavior
Programme : MBA (Trimester)
Term : I
Credits : 3

***Time required in terms of Student Learning*: -**

Learning	Hours
Contact	**25**
Guided study	**30**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Aim & Objectives:
The aim of the course is to help the students appreciate the role and scope of management & its applications. At the end of the course the students will develop a solid foundation of management theory and practice.

Teaching and Learning Approach:
Students will learn through a combination of face-to-face contact and guided study. Personal contact sessions will include Presentations, case studies, self evaluation exercises, classroom discussion.
Guided Study:
Guided study will include text readings, articles on contemporary issues in organization, assignments, case analysis and power point presentations.
Assessment:
Assessment of the student will be based on mid-term and end term examination and continuous assessment subject to class participation, assignments and presentations.
Indicative Contents:

Topic	Coverage	No. of Lectures
Introduction to management& OB **Management & OB yesterday, today & tomorrow**	• .Management, process, levels of management, managerial roles & skills, • Meaning & Significance of OB • Scientific Management, • general administrative management, hawthorne experiment,System Approach, • Contingency theory. • New thinking on management	**4**
Planning:	• hierarchy of plans, • planning process, objectives & goals,	**2**
Organizing	• organization structures,Changing shapes of organizations, Span of Control, Centralization& decentralization, • Authority& Responsibility	**2**
Controlling:	• Coordination –techniques & types**.** • Control: process, tools for controlling	**1**
Perception	• Meaning, Factors influencing perception, perceptual process, Errors in perception, attribution theory	**2**
Personality	• Determinants, Major personality traits, Theories- type, trait, self theory, psychoanalytical (Sigmund Frued),. Big Five Model, MBTI.	**2**
Learning	• Concepts and Theories- classical conditioning, operant conditioning, cognitive learning, social learning theories. Reinforcement	**2**
job satisfaction	• Job satisfaction and organization commitment, causes and consequences of job dissatisfaction, Job Satisfaction and Productivity.	**1**
Motivation	• Theories of Motivation-hierarchy of needs, two factor theory, theory XYZ, theory of needs, expectancy theory and equity theory; Motivation-from concepts to application	**3**

Emotional intelligence, knowledge management & and stress	• Meaning and definition of EI & knowledge management • Work stress, burnout, approaches to stress, causes and consequences of stress, managing stress,.	**2**
Interpersonal relationship	• Managing Interpersonal Relationship at work- Transactional analysis, Johari Window.	**2**
Managing organizational process	• Power & politics • Organizational culture	**2**
Total		**25**

Recommended Reading :

1. James A.F.Stoner, "***Management***" Pearson Education, 6th Edition.
2. Robbins & Coulter, "***Management***" Prentice Hall of India,
3. Stephen P. Robbins, Sanghi "***Organizational Behaviour"*** Concepts, Controversies, and Applications", New Delhi, Prentice Hall, New Edition
4. Fred Luthans, "***Organizational Behaviour***" New York, McGraw Hill, 10th Edn., 2005.
5. Kinicki& kreitner "***Organisational behavior***" McGraw-Hill.

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : **Managerial Economics**
Programme : **MBA (Trimester)**
Term : **I**
Credit : **3**

Time required in terms of Student Learning:

Learning	Hours
Contact	**25**
Guided study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Aim & Objectives:

The paper seeks to equip the students with the analytical tools of Economics and apply the same to rational managerial decision-making. It further seeks to develop economic way of thinking in dealing with practical business problems and challenges both nationally and internationally.

Teaching / Learning Approach:

Students will learn through a combination of face-to-face contact and guided study. Personal contact sessions will include case study analysis, simulation exercises, numerical problem solving, and presentations. Guided study will include preliminary text readings (defined by lecturer). Additional material will also be emailed by presenters. This module gives a broad introduction to microeconomics, which analyses how individual markets work – how prices are set and resources are allocated in an economy.

Guided Study:

Guided study will include text readings, articles on contemporary issues in organization, assignments, case analysis and power point presentations.

Assessment:

Assessment of the student will be based on mid-term and end term examination and continuous assessment subject to class participation, assignments and presentations.

Indicative Contents:

Topic	Coverage	No. of Lectures
1. Introduction to Managerial Economics	Introduction to Economics .Circular Flow of goods and services. Basic Problem of an economy scarcity of resources with multiple uses and unlimited ends. Basic Problems of Business and Managerial Decisions and underlying paradigms.	**3**
2. Cardinal Demand Analysis	Concepts: Need, Desire, Want and Demand; Individual Demand and Market Demand; Law of Demand, Change in Demand and Shift in Demand Function; Concepts of Utility: Total, Average and Marginal; Laws of Marginal Utility and Equi-Marginal Utility; Consumers' Equilibrium	**4**
3. Ordinal Demand Analysis	Basic Features of Indifference Curves; Consumers' Equilibrium; Income effect, substitution effect and price effect; Reveled Preference Theory.	**4**
4. Elasticity	Elasticity of Demand –Concept and Measurement; Price and Income Elasticity and Decision Making; Market Demand-Concept and Derivation; Demand Forecasting: Concepts of Projection; Prediction and Forecasting; Demand Forecasting Techniques; Illustration: Practical Applications.	**4**

5. Production	Introduction to the theories of production and cost; Law of variable proportions; law of return; Revenue curves of a firm	**4**
6. Market Structures	Price-output decisions of the firms under alternative market structures: Perfect competition; Monopoly, Monopolistic competition and oligopolistic competition: Different Theories and Models; Shut-down points;	**4**
7.International Trade	Basis of international trade, gains from trade, Factor endowment &mobility.	**2**
TOTAL		**25**

Recommended Reading:

1. Hirschey,M "***Economics for Managers"*** (Indian Edition): Cengage Learning:(2006) New Delhi [TEXT]
2. McGuian, James Moyer, R. Charles & Harris, Frederick, H.deB "***Managerial Economics***" Applications, Strategy and Tactics (Indian Edition): Cengage Learning: , (2005) New Delhi
3. Pindyck,Robert S. Rubinfield, Daniel L. Mehta, Prem L. (2005) "***Microeconomics"*** Pearson Education Inc. Indian Reprint, 2011.
4. Samuelson Paul A. and William D. Nordhaus, ***"Economics***" (18thEd), Tata Mc Graw Hill Publishing company ; Chapt 15.
5. Ball, Donald A., Wendell H. Mc Culloch, Jr.; J Michael Geringer, Michael S. Minor and Jeanne M.Mc Nett, "***International Economics"*** 2008, McGraw Hill , Chapt.3

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : Marketing Management
Program : MBA(Trimester)
Term : I
Credits : 3

Time required in terms of Student Learning:

Learning	Hours
Contact lectures	**25**
Guided study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Aim and Objective:
The Objective of this course is to develop an understanding of the concepts, strategies and issues involved in marketing. In its simplest form, marketing is the bridge between customers and products or services. Marketers must know how to study and analyze markets and their environment. Based on market analysis, marketing managers recommend the appropriate marketing mix, consisting of decisions about product, price, channel, and promotion (integrated marketing communication). Understanding what options are available and how to choose is integral to the role of the marketing manager.

The results of the decisions made by marketers are seen daily by consumers in retail stores, online, and in their homes, the decisions made behind the scenes are rarely obvious. Technology has had an enormous impact on the field of marketing; the average consumer would likely be amazed by how many options were considered and ultimately discarded to bring their favorite product to market.

Marketing managers interact with many functions in the organization, and must understand what drives the priorities of their functional counterparts, to successfully convert marketing strategies into implementation plans.

Guided Study:
Guided study will include text readings, articles on contemporary issues in organization, assignments, case analysis and power point presentations.

Assessment:
Assessment of the student will be based on mid-term and end term examination and continuous assessment subject to class participation, assignments and presentations.

Indicative Content:

Topic	Coverage	No. of Lectures
Introduction to marketing	Core concepts, Marketing and selling, Marketing mix. Marketing Myopia Factors affecting marketing environment. customer satisfaction, customer value, concept of value chain. Market Segmentation, Targeting & Positioning.	**5**
Product Decisions	Product Classification Product Mix,	**4**

	Product Life Cycle New product development & Branding decisions	
Pricing Decisions	Pricing:-Different types of Pricing Pricing Strategy & Decisions	**2**
Distribution Decisions	Nature and types of Marketing Channels Functions of Channel intermediaries	**4**
Understanding Consumer Behaviour & Promotional Decisions	Customer vs. consumer, factors affecting consumer behaviour, consumer decision process, Dissonance theory Promotion Mix,Promotional Strategies,Concept of ATL & BTL	**4**
Contemporary & Emerging Issues	Marketing through Social Media E-Commerce Green Marketing Rural Marketing Emergence of IT Ethical & CSR Issues in Marketing	**6**
TOTAL		**25**

Recommended Reading:

1. Kotler, Philip, "***Marketing Management***" Prentice Hall.
2. Arun Kumar, N Meenakshi, "***Marketing Management"*** Vikas Publishing.
3. Ramaswamy & Namakumari, "***Marketing Management"*** McMillan.
4. Kurtz & boone, "***Principles of Marketing"*** Cengage.
5. Kotler & Armstrong, "***Principles of Marketing"*** Prentice Hall.

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title: **Written Analysis of Cases (WAC)**
Program: **MBA (Trimester)**
Term: **I**
Credits: **1**

Time required in terms of Student Learning:

Learning	Hours
Contact	**10**
Guided Study	**05**
Projects and Assignments	**05**
Assessment	**05**
Total	**25**

Course Description:

WAC I refines students' written communication skills by helping them analyze problem situations, make/suggest decisions, and communicate recommendations/decisions.

Objectives:

Sharpening analytical skills in managerial decision making situations.

Improving written communication skills, especially report writing.
Developing communication briefs related to specific situations or events within an organization.
Conducting company as well as industry level analysis and interpreting current internal and environmental issues related to the industry and the company.

Pedagogy:

Students are given cases to analyze and write analytical reports. Detailed written feedback is given to all students; this is supplemented by common oral feedback. Classroom sessions augment the thinking process and help in the development of written as well as spoken communication.

Session plan:

Topic	Session	Issues to be discussed	Reading material	Cases	Assignment
Introduction to WAC	1			The case difficulty cube • The analytical dimension • The conceptual dimension • The presentation dimension The three stage process of learning written communication with cases.	
structure present	1			How to structure and present your wac report	
Case discussion	1			Case: Rocky mountain mutual: Promoting fun or fitness?	

				Jane thomes, university of Michigan, ann arbor Question : what " pretty persuasive arguments" should joe mirola present to Zachary evans to get him to change his mind about closing the fitnesss center?	
Assignment question	1			Beyond the assignment question: • The short cycle process • The long cycle process.	
Prereaes	1			Prerea: I. Introduction to decision making II. Managing the new millennium Decision making: A key to successful management patricia M buhler .	
Topic	1			Topic : A note about language	
Cases	1			Case: class or mass. Pre-reacs: What you don't know about making decision.	
Illustrative cases	2			Illustrative cases	
Case:	2			Case: Hcde design – prof. koshy	
Feedback	1				
Case accounting procedures at champion marketing institute.	2				
Case presentations	2				
Conclusion :	1			Managing your learning process	

Evolution:

Assignment/exam	Weight (percentage)
Class participation	10%
Case 1	10%
Case 2	15%
Case 3	20%
Case 4 (presentation)	10%
Term-end exam	30%
Total	100(credit 0.50)

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title: **Cost & Management Accounting**
Program: **MBA (Trimester)**
Term: **II**
Credits: **3**

Time required in terms of Student Learning:

Learning	Hours
Contact	**25**
Guided Study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Module Aim
Cost and Management accounting are the internal mechanism of reporting within the modern business. The subject is fundamental to the financial operation of an efficient modern business. On completion of the module students will be able to understand and apply a variety of techniques currently in use.

Module Objectives/ Learning Outcomes
On completion of this module the student will be able to:

1. Describe the goal of cost accounting techniques and evaluate their relevance in the current commercial world.
2. Understand the application of the various techniques and analyze their impact on business profitability. Calculate costing under each of the techniques and examine the results.
3. Define budgeting and describe its relevance as the main tool of management's financial control in modern businesses. Calculate budgets from source materials and explain the relevance of the result. Interpret the result of variance analysis to allow recommendations to other non financial managers.

Teaching and Learning Approach
Students will learn through a combination of face-to-face contact and guided study. Personal contact sessions will include case study analysis, numerical problem solving, and presentations. Guided study will include preliminary text readings (defined by lecturer). Additional material will also be emailed by presenters.

Indicative Content
Following set of topic will help to achieve the learning outcomes.

Topic	Covers:	Sessions
Introduction	• Difference Between Cost , Management and Financial Accounting • Users of Cost and Management Accounting • Various cost concepts • Scope of Management Accounting	3
Basics of Costing And Cost sheet	• Basics of Cost and cost accounting. • Different elements of costs • Introduction to various types of overheads • Preparation of Cost sheet	5
Marginal Costing	• Cost Volume, Profit analysis • P/V ratio, analysis and implications • Concept and uses of contribution • Breakeven point and its analysis • Differential Costing and incremental costing;: concept, uses and applications	7
Budgeting	• Concept of Budget	

	• Budgeting and Budgetary Control • Types of Budget • Preparation of :- ✓ Cash Budget ✓ Master Budget ✓ Fixed & Flexible Budgets • Advantages and Limitations of Budgetary Control.	7
Variance Analysis	• Concept of Variance • Material Variance • Labor Variance	3

Recommended Text:

1. Horngren et al - "Introduction to Management Accounting" (Pearson)
2. Khan and Jain – " Management Accounting" (Tata McGraw Hill)
3. Pandey I.M – "Management Accounting" (Vikas)
4. Sahaf M.A.-"Management Accounting–Principles and Practice" (Vikas)
5. Ravi M. Kishor – "Advanced Management Accounting" (Taxmann)

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : **MARKETING RESEARCH**
Programme : **MBA (Trimester)**
Credits : **3**
Term : **II**

***Time required in terms of Student Learning*:**

Learning	Hours
Contact	25
Guided Study	25
Projects and Assignments	15
Assessment	10
Total	75

Aim & Objectives

1. **To develop knowledge in framing research project, data collection, and processing techniques and data analysis.**

2. **To develop knowledge in the applications of business research in the marketing & organizing marketing research activities in the organization.**

Teaching and Learning Approach

Guided Study

Guided study will include text readings, articles on contemporary issues in organization, assignments, case analysis and power point presentations.

Assessment

Assessment of the student will be based on mid-term and end term examination and continuous assessment subject to class participation, assignments and presentations.

Indicative Contents

Topic	Coverage	No. of Lectures
Nature and Scope of Marketing Research	**Need to know the customer, definitions and meaning of marketing research, applications of marketing research.**	3
The Research Process:	**Creating Research proposal, Steps in designing a research project, scientific method in the physical sciences and marketing, preparation of research report.**	3
Types of research designs	**Exploratory and conclusive, various methods, their importance and limitations. Product research. Advertising research. Sales analysis and forecasting.**	3
Value of Information	**Types of data (primary and secondary), data sources, data collection methods, questionnaire construction, types of questionnaires.**	2
Sampling	**types of sampling, sampling methods to marketing problems, Sampling error**	2
Attitude Measurement:	**Methods of measuring attitude, scales of attitude measurement, semantic differential scale, thrustone scale, likert scale, multidimensional scaling.**	4

Managing Research Data	**Processing of data, tabulation of data, and analysis of data (Uni- variant analysis, multivariate analysis, chi-square analysis, t-test and z-test), cluster analysis, factor analysis and conjoint analysis.**	6
Research Agencies	Nature, scope and functions of Research agencies.	1
Research Report	**Standard Research Report formats**	1
TOTAL		**25**

Books/References Recommended :

1. Parsuraman, Dreamtech "***Marketing Research***" 2006.
2. Boyd & Westfall "***Marketing Research***" Text and Cases, 2005.
3. Rajendra Nargundkar, "***Marketing Research***" Talk Mc graw Hills 2008 .
4. Paul Green & Donald tull, "***Research of Marketing Decisions"*** by Gerald album.
5. Cooper Schindler, "***Marketing Research***" concepts & Cases - 2007.

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : **BUSINESS ENVIRONMENT**
Program : **MBA (Trimester)**
Term : **II**
Credits : **3**

Time required in terms of Student Learning:

Learning	Hours
Contact	**25**
Guided Study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

MODULE AIM

THE AIM OF THIS MODULE IS TO ENABLE STUDENTS TO ANALYZE AND CRITICALLY APPRAISE THE ECONOMY AT THE MACRO-LEVEL IN A GIVEN SITUATION. IT ALSO AIMS TO DEVELOP STUDENT UNDERSTANDING TO THE POINT THAT THE STUDENTS WILL BE ABLE TO IDENTIFY THE TARGET AREAS WITHIN A CERTAIN ECONOMY AND PROVIDE SOLUTIONS AND MEANS TO OVERCOME IDENTIFIED PROBLEMS

LEARNING OUTCOMES

UPON COMPLETION OF THIS MODULE, THE STUDENTS WILL BE ABLE TO

1. ANALYZE THE ECONOMIC ENVIRONMENT FOR CORPORATE DECISION-MAKING.
2. CONDUCT AND APPRAISE THE CHANGING ECONOMIC PARAMETERS AND THEN DEVISE APPROPRIATE SOLUTIONS FOR THE COMPANY IN QUESTION
3. DEMONSTRATE A CLEAR GRASP OF HANDLING STATISTICAL DATA RELATED TO A GIVEN ECONOMY.

MODULE DESCRIPTOR

Teaching and Learning Approach

Students will learn through a combination of face-to-face contact and guided study. Personal contact sessions will include case study analysis, simulation exercises, numerical problem solving, and presentations.

Guided study will include preliminary text readings (defined by lecturer). Additional material will also be emailed.

Indicative Content

Following set of topic will help to achieve the learning outcomes.

Topic	Covers:	Hours
Introduction to Economic Environment	• Significance and nature, • The interaction matrix of different environment, factors, • The process of environmental scanning • Macro and micro indicators; • Assessing risk in business environment.	6
Indian Environment	• Concept of mixed economy: the public sector and the private sector, their changing roles; • Current industrialization trends and industrial policy; • Environment for the SME sector; • infrastructure development and policy; • Public-private partnership.	7
Inflation & its effects	• Concept, Causes, Consequences • Taming Inflation-policy measures • Monetary Policy	6

India & the Global Environment	• Globalization trends and challenges; • Environment for foreign trade and investment; • Exchange rate movements and their impact; • External influences on India's business environment.	6

Recommended Text (s)/ Readings:

1. Macroeconomic by DERNBURG / McDOUGALL (Mc Graw Hill)
2. Macroeconomics and Monetary Theory by HARRY G JHONSON (Basil Blackwell Oxford)
3. Economic Fluctuations and Forecasting by EDWARD J. CHAMBERS
4. "Modern Economic Theory" by KK Dewett, M.H. Navalur and Janmejoy Khuntia of S. Chand and Company Ltd.
5. "Macroeconomics" by Dornbusch, Fischer, Startz,Tata McGraw Hill.

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : **Business Laws**
Program : MBA (Trimester)
Term : II
Credits : 3

Time required in terms of Student Learning:

Learning	Hours
Contact	25
Guided Study	25
Projects and Assignments	15
Assessment	10
Total	75

Aims

This course offers MBA students the basics of mercantile laws, also known as commercial laws.

Knowledge of mercantile laws applicable to trade, commerce and industry is necessary for important reasons. First people must understand the legalities involved in working with, managing or running a business organization. Business managers realize that legal compliance by their organization is the bottom line to avoid costly financial risks and to facilitate business success. Secondly some mercantile law areas such as contracts, sale of goods, business partnerships, and consumer protection impact on businesses more prominently.

BBA students in general will gain an advantage at job interviews as all organizations seek employees who can eliminate or at least minimize undue costs and financial risks to the organization.

Objectives

On successful completion of this course students will:

1. Understand how mercantile laws affect business organizations as well as the daily lives of ordinary citizens
2. Develop knowledge of the legal provisions under mercantile laws, the rights and duties of parties, and the available remedies
3. Use Bare Acts, and interpret statutory materials
4. Apply legal reasoning to identify and solve legal issues
5. Utilize their knowledge for business advantages, risk elimination or minimization

Indicative Contents:

Modules	Module Details	Graded Tasks	No.of Lectures
Introduction to Law	What is law? What are the institutions that enforce law? Government - the role of its three organs: legislature, executive, judiciary. What do we need laws for? What are the different types of laws that business managers need to know about? Where do the laws come from? Laws from other jurisdictions - Why do universities or HR or accounting firms offer training packages in laws of different countries?		3

Indian Contract Act 1872	What is a contract? Social *vs.* Business Agreements. How is a contract made? Essentials of a valid contract: offer, acceptance, consideration, competence to contract, free consent, lawful object. Types of contracts. Void agreements. Quasi contract. Indemnity. Guarantee. Discharge of contract. Remedies for breach of contract. **Regular Exercise** Review illustrations and problem-questions.	Decide a case. Apply legal reasoning.	**8**
Sale of Goods Act 1930	What is a contract for sale of goods? Similarities with and modification to general contract law provisions. Transfer of property. Conditions and warranties - *caveat emptor*. Performance of contract of sale. Rights of unpaid seller. Remedies for breach of contract for sale. **Regular Exercise** Review illustrations and problem-questions. **Group Task** (non-graded) Review terms and conditions in a commercial contract.	Group Presentations	5
Negotiable Instruments Act 1881	What are negotiable instruments? Types of instruments. Parties to instruments. Methods of negotiating instruments. Endorsement and delivery of instruments. Holder in due course. Negotiation by unauthorized parties. Negotiation of dishonored and overdue instruments. **Regular Exercise** Review illustrations and problem-questions.		4
Partnership Act 1932	Economic philosophy behind the *Act*. What is a partnership? Types of partners. How to make a partnership firm. Partnership deed. Registration of a partnership firm. Effects of non-registration. Rights, duties and liabilities of partners. Dissolution of a partnership firm. **Regular Exercise** Review illustrations and problem-questions.	Group Project Form a (fictitious) Firm and register it. Go to Registrar of Firms to gather Information.	3
Consumer Protection Act 1986	Cliché - consumer is king. Purpose of the *Act*. Important definitions under the *Act*. Rights of consumers. Who can file complaints? Consumer courts: District Forum, State Commission, National Commission. How to file complaints? Complaint format. Remedies. Sample of complaint form. **Regular Exercise** Review illustrations and problem-questions.		2
TOTAL			25

Teaching and Learning Methods

- Lectures and visual power point slides
- Students read suggested books and research articles before the next lecture
- Students participate in class discussions
- Students prepare a glossary of difficult legal terms and look up a law dictionary

Graded Tasks

- Case studies
- Individual or group presentations
- Group projects
- Quizzes

Suggested Readings

- Singh, Avtar, *Mercantile Law*, 8th ed., 2006, Reprinted 2008, Eastern Book Company

- Kuchhal, M.C. and Prakash, D., Business Legislation for Management, 1st ed., 2007, Reprinted 2008, Vikas Publishing House
- Kuchhal, M.C., Mercantile Law, 7th ed., 2009, Vikas Publishing House
- Gulshan, S.S., Business Law, 3rd ed., 2006, Excel Books
- Tulsian, P.C., Business Law, 2nd ed., 2001, Tata McGraw-Hill

Bare Acts

Indian Contract Act 1872
Sale of Goods Act 1930
Negotiable Instruments Act 1881
Partnership Act 1932
Consumer Protection Act 1986

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : **Business Communication-II**
Program : MBA (Trimester)
Term : II
Credits : 3

***Time required in terms of Student Learning*:**

Learning	Hours
Contact	25
Guided Study	25
Projects and Assignments	15
Assessment	10
Total	75

INTRODUCTION

Pedagogy

The course would be completely functional and there would not be written test at all. All the evaluations would be based on the classroom individual and group dynamics.

Session Plan:

Topics	Reading Material	Class Room Activity	No.of Lectures
Introduction to the course	HBR: Guide to getting a job	Presentation	1
Resume Writing: Techniques, method, how to make an impressive Resume	Cover letters, Resumes, perfect elevator to pitch yourself	Presentation	1
Peer review	Make a network of yourself	feedback	1
Group Discussion		Presentation	1
Mock GD		Mock GD	5
Interview	How to ace an Interview	Presentation	1
Individual Interviews		Mock Interviews	6
Feedback Session	Make a net work for yourself, Reference letters	Individual student problems areas and addressing them	4
Presentation skills		Model presentation Individual presentations	5

Learning Outcomes
This course reflects situations that the students may face as a professional and will deepen their UNDERSTANDING AND EFFECTIVE USE of the verbal skills and tools learnt so far.

Suggested Readings:

1. Business Communication Today, Bovee, Thill, Schatzman
2. Business Communication, Mary Allen Guffy
3. Business Communication, Mary Munter
4. Professional Communication, Aruna Koneru – Tata McGraw-Hill
5. Business Vocabulary in Use, Bill Mascull – Cambridge University Press

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : Operations Research
Program : MBA
Term : II
Credits : 3

Time required in terms of Student Learning:

Learning	Hours
Contact	**25**
Guided Study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Module Objectives:
The Course is designed to make student understand the significance of Operations Research, to acquaint them with application of discipline to deal with real life business problems.

Delivery Methods:
The course will be delivered through lectures, discussions and analysis, cases, and applications, exercises and designed to develop skills in analytical ability.

Lecture Plan:

Topic	Coverage	No. of Lectures
Introduction to Operations Research	• Definition • Uses, Scope and Applications of Operations Research in business decision-making.	1
Linear Programming	• Formulation • Applications • Graphical Method • Simplex Method • Computer Solutions	3
Transportation Problems	• Special Cases in Transportation Problem & their applications	4
Assignment & Travelling Salesman Problem	• Special Cases & their applications	2
Goal Programming	• Formulation • Graphical Method • Applications	2
Decision Theory	• Risk, uncertainity & certainity • Expected Monetary Value • Expected Value of Perfect Information • Decision Tree Analysis	4
PERT & CPM	• Network Diagram • Critical Path Method	3
Game Theory	• Saddle Point • Rule of Dominance • Algebraic Method • Graphical Method	2
Queuing Models	• Introduction to Queuing system • (M/M/1:∞/FIFO) Model and its applications	4

Suggested Readings

- Decision making through operations research by Robert J. Thierauf, Robert C. Klekamp, 2d ed., New York : John Wiley
- Quantitative Techniques for Decision Making by M.P. Gupta & R.B. Khanna, Fourth Edition, Prentice Hall of India, New Delhi
- Operations Research Theory & Applications, J.K. Sharma, McMillan India Ltd.
- Operations Research for Management, M.P.Gupta, Third edition, Book Bank International, Delhi
- Vohra N.D: Quantitative techniques in management, 2010 edition, Tata Mcgraw Hill

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : **Team building, Leadership and Change Management**
Program : **MBA (Trimester)**
Term : **II**
Credits : **3**

Time required in terms of Student Learning:

Learning	***Hours***
Contact	*25*
Guided Study	*25*
Projects and Assignments	*15*
Assessment	*10*
Total	*75*

Aim& Objectives

This course is designed to provide students with a comprehensive understanding of fundamental aspects of team dynamics and communication among team members and to identify the steps necessary to design and implement effective organizational team work. It will also facilitate the understanding of the concept of leadership as a phenomenon and its impact on the organizational behavior of individuals and change. The topics covered in this course will help the students to develop a framework for understanding the internal operation of groups, small and large – and help them as a leader, manager, or key contributor, to enhance the efficiency and effectiveness of the working groups to which they belong. By the end of this module, the students would be able to understand the concept of leadership and its impact on business in terms of change.

Teaching/ Learning Approach

Students will learn through a combination of face-to-face contact and guided study. Personal contact sessions will include case study analysis, simulation exercises, numerical problem solving, and presentations. Guided study will include preliminary text readings (defined by lecturer). Additional material will also be emailed by presenters.

Guided Study

Guided study will include text readings, articles on contemporary issues in organization, assignments, case analysis and power point presentations.

Assessment

Assessment of the student will be based on mid-term and end term examination and continuous assessment subject to class participation, assignments and presentations.

Indicative Content

Following set of topic will help to achieve the learning outcomes.

S.No.	**Topics**	**No. of Lectures**
1.	• Group dynamics: concept of group, group formation, types of groups, reasons to join groups, group structure, group cohesiveness, group decision making, group vs. individual decision making, techniques of group decision making, advantages and pitfalls of group decision making. • Team dynamics: nature of team, contemporary issues in managing team • Conflict-Sources of conflict, conflict management and prevention,	**4**
2.	**Concept** • Concept of leadership • competencies of leadership	2
3.	**Leadership and management** • leadership differentiated from management • Determining effectiveness	2
4.	**Theories of leadership** • Trait theories of leadership • Behavioral theories : power orientation, managerial grid, • Contingency and situational theories of leadership: Fiedler's contingency model,	4

	Hersey & Blanchard's situational model, path goal model	
5.	**Theories of Leadership** • Theories of charismatic leadership • Level 5 leadership • Transactional leadership • Transformational leadership • Authentic Leadership: Ethics & Trust • Challenges to leadership in virtual teams	5
6.	**Change Management** • Forces for change • The nature of Planned organizational Change ➢ Theories of Planned Change ➢ Change agents, Different types of organizational change	4
7.	**Leading change in organizations** • Resistance to change • Resistance to change- individual sources, organizational sources • Managing resistance to change • Influencing organizational culture, • Managing & implementing change	4
	TOTAL	25

Books Recommended

- Yukl Gary, Leadership in Organization, 6t Edition, 2007, Pearson
- Hersey Paul, Blanchard Kenneth H., Johnson Dewey E., Management of Organizational Behaviour: Leading Human Resources, 9th Edition, 2008, PHI.
- Haldar: Leadership & team building 1st edition 2010,Oxford
- Cummings & Worley, Organization Development & Change, 8th Edition, 2010, Cengage Learning.
- Leadership Change Maestros(exact name to be included)

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : Human Resource Management
Program : MBA
Term : II
Credits : 3

Time required in terms of Student Learning:

Learning	Hours
Contact	25
Presentations	25
Projects and Assignments	15
Assessment	10
Total	75

Aim & Objectives

The course is an introduction to the theory and practice of Human Resource Management (HRM) in the firm and deals with HRM principles and practices that HR specialists and managers commonly use to employ and manage people to achieve expected objectives.
On completion of this module the student will be able to:

1. Describe and discuss the roles played by Human Resource Management in relation to other functions to achieve organizational goals.
2. Describe and critically assess the basic HRM functions
3. Apply HRM techniques operationally in an organization.
4. Critically evaluate current issues and best practices in human resource management.

Teaching/Learning Approach

Teaching/ learning approach will include following methods:

- Lectures supported with overhead transparencies or power point slides and handouts
- Group Discussions
- Management Games
- Case Studies
- Individual and Group Presentations
- Students will be sent to interview Industry personnel to share about there experiences.
- Text book readings and Articles.
- Projects
- Quiz

Guided Study

Guided study will include text readings, articles on contemporary issues in organization, assignments, case analysis and power point presentations.

Assessment
Assessment of the student will be based on mid-term and end term examination and continuous assessment subject to class participation, assignments and presentations.

Indicative Content

Topic	Coverage	No. of Lectures
HRM & Strategic HRM	• Meaning and Definition; Nature and Scope; Significance, Functions and objectives;	4

	• HRM a staff function and line responsibility, • HR Policies, Role of HR manager • HRM and Strategic HRM	
Human Resource Acquisition and Preparation	• Human Resource Planning: Definition, Objectives of HRP, Need & Importance of HRP, Process of HRP; Job Analysis. • Recruitment & Selection Process, - Sources, • Employee retention; Career & succession planning	6
	• Training & Development: need for training, Training & development methods, training process,	3
HR Assessment and Compensation	• Performance Appraisal: Meaning, need and purpose, process, methods of performance appraisal, Performance appraisal in practice. Potential Appraisal • Job Evaluation: concepts, objectives, process, Advantages and limitations, methods of job evaluation	5
	• Compensation management: Introduction and objective of compensation, types of compensation, • Incentive & fringe benefits; Reward & recognition- Practices in Indian organizations.	4
Maintaining & Integrating HR	• Employee welfare & social security • Discipline & grievance • Industrial relations	3
TOTAL		25

Suggested Readings:

- Price Alan, Human Resource Management in Business Context, 3rd Edition, Cengage Learning, 2011.
- Cascio Wayne F., Managing Human Resources, 7th Edition, Tata McGraw Hill, 2006.
- Rao V. S. P., Human Resource Management- text and cases, 5th edition, Excel Books
- Aswathapa K., Human Resource Management- Text and Cases, 5th edition, The McGraw Hill
- DeCenzo Robbins, Fundamentals of Human Resource Management, 8th edition, Wiley-India Edition.

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : **Financial Management & Control**
Programme : **MBA (Trimester)**
Term : **III**
Credits : **3**

Time required in terms of Student Learning:

Learning	Hours
Contact	25
Guided study	25
Projects and Assignments	15
Assessment	10
Total	75

Module Aim:

Financial Management and policy deals with the decision of the firm related to Investment, Financing and Dividend. The module aim is concerned with the analysis of financial decisions, capital budgeting, managing working capital and other financial decisions and policies.

Module objectives/ Learning outcomes

On completion of this module the student will be able to:

4. Describe the goals of Financial Management and evaluate their relevance in the current corporate world.
5. Understand the concept of time value of money and cost of capital.
6. Understand the logic of trade off between distribution of dividend and retained earnings and the different dividend policy.
7. Manage working capital and firm's policy for receivables, inventory and cash.
8. Understand other contemporary policy issues in the area of finance,

Teaching/Learning Approach

Students will learn through a combination of face-to-face contact and guided study. Personal contact sessions will include Presentations, calculation of major techniques, classroom discussion and the additional work outside of class.

Guided study will include text readings and articles on contemporary issues in Corporate Finance which have appeared in economic/business newspapers in 2010-11. Additional material will also be emailed by presenters.

Throughout the teaching/learning process a focus will be maintained on the application of techniques currently in use. This will include a survey of the prevalence of use in contemporary Indian commerce

Indicative Content:

Unit	Contents	sessions
Financial Management: An Overview	• Functions & Key Activities of Financial Management • Objectives and goals of Financial Management • Time value of money- present & future value, simple & comp. interest, annuity and perpetuity	4
Concept of Cost of Capital	• Cost of Debt • Cost of Equity • Cost of Preference share capital • Weighted Average Cost of Capital	4
Capital Budgeting	• Payback period, Accounting Rate of Return, • Discounted Cash Flow Technique :- ✓ Discounting Payback period,	6

	✓ NPV ✓ IRR	
Dividend Policy	• Concept of Retained Earning • Relevance and irrelevance of Theories of Dividend Decisions: ✓ Walter's Model ✓ Gordon's Model	5
Working Capital Management & Ploicy	• Management of Working Capital • Inventory Management • Receivables Management • Cash Management	4
Contemporary Issues	• Introduction to Merger and Acquisitions • Lease Financing	2
TOTAL		25

Suggested Readings:

1. Ross-Westerfield-Jaffe - "Corporate Finance" (International Student Edition)
2. Glen Arnold – " Corporate Financial Management" (FT-Prentice Hall)
3. Haim Levy – "Principles of Corporate Finance" (South Western)
4. Ross-Westerfield-Jaffe.-"Fundamentals of Corporate Finance" (TMH)
5. Khan and Jain – "Financial Management" (TMH)
6. Fundamentals of Financial Management by Van Horne and Wachowick
7. Financial Management by I.M.Pandey

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title: **Marketing Strategy**
Program: **MBA (Trimester)**
Term: **III**
Credits: **3**

Time required in terms of Student Learning:

Learning	Hours
Contact	25
Guided Study	25
Projects and Assignments	15
Assessment	10
Total	75

Module Aim

The course develops insights into:

(a) Identification of the organizations, competitors, their objectives, strategies, strengths and weaknesses and response profile.

(b) Development of competitive strategies including the competencies to be employed and the marketing strategies to be adopted based on competitors and customer response profiles.

Module Objectives/ Learning Outcomes

a) Student will learn the basics of strategy formulation in respect to marketing of various organizations
b) Student will learn the various marketing strategy practices of industry at domestic and global level.

Teaching and Learning Approach

Students will learn through a combination of face-to-face contact, Interactive Session, Related Activities and guided study. Personal contact sessions will include case study analysis, activities, Live Projects and presentations. Guided study will include preliminary text readings (defined by the tutor). Supporting material will be provided to the students as and when required.

Indicative Contents

Topic	Coverage	No. of Lectures
Marketing Strategy: An Introduction	Strategic windows to markets, what is strategy, what is marketing strategy, marketing strategy formulation	2
Analysis of the Industry and the Enterprise	Firms as subsets of markets, markets as subsets of industry, Industry Structures and Life Cycles, drivers of industry, objectives, strengths and capabilities of the firms, approaches to self analysis of the firm, marketing competencies and resource based view, value chain analysis	2
Analyzing Market and Competition	Market dynamics and key success factors, market size, growth rates and profit potential at various stages of growth, measurement and forecasting, competitors and nature of competition, basis for competition, core competency, differential advantage, competitor typologies, case discussion	3

Analyzing business environment and the customer	Dynamic environment, hostile or supportive environment, SWOT, SAP, ETOP, influencing changes in environment, markets as sets of customers, customer – environment interactions, customer – firm interactions, causes and consequences of customer behavior	4
Portfolio analysis	Product life cycle and product portfolio, portfolio model for analysis, BCG matrix, product life cycle portfolio matrix, selection of markets, GE/ Mckinsey Matrix, Directional Policy Matrix, Multi factor matrix, case discussion	3
Sustainable competitive advantages and generic strategies	Competitive advantages, sustaining the advantage, market led advantage, core competencies, and associated generic strategies, low cost, focus, pre emptive strategies, differentiation strategies, product and service quality, customer focus and brand differentiation	2
Segmentation, Targeting and Positioning strategies	Simplification of market complexity for manageability, ad hoc segmentation,. Empirical segmentation, target selection to align possibilities, objectives and capabilities, competitive positioning, corporate positioning, brand positioning, product line positioning	3
Marketing Mix Strategy	Designing the marketing mix for strategic positioning, product strategy, pricing strategy, distribution and channel strategy, integrated marketing communications strategy, tactics and strategy, product differentiation, cost reduction strategy, case discussion	2
Growth Strategies: Product Market Expansion	Ansoff Matrix and generic strategies for growth, product development, integration strategies, diversification, entry and exit strategies, egan's matrix	2
Planning and Facilitating the implementation of strategies	Strategic collaborations, partnerships and networks, from transactional management to relationships management, putting plans and strategy to implementation, barriers to implementation, post implementation	2

References:

1. Strategic Market Management, Aaker, David A.
2. Strategic Marketing Management, Richard M.S. Wilson, (Viva)
3. Strategic Marketing: An Introduction, 2000, London:Routledge
4. Strategic Marketing: Cases & Concepts John Atkinson & Ian Wilson – Addison –Wesley Longman
5. Strategic Marketing, 5e David W Cravens – Irwin Inc

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title **International Business**
Program: **MBA (Trimester)**
Term: **III**
Credits: **3**

Time required in terms of Student Learning:

Learning	Hours
Contact	25
Guided study	25
Projects and Assignments	15
Assessment	10
Total	75

Module Aim
To expose the students to different dimensions of international business in a global environment.

Module Objectives
Upon successful completion of this course, students will be able to:

- Generate awareness about major issues in international business today.
- Appreciate and have basic idea about the basis of international trade.
- Understand the rationale for intervention by state in matters affecting international business.
- Gets a brief idea about the role of international organizations impacting international business

Teaching and Learning Approach

Students will learn through a combination of face-to-face contact and guided study. Personal contact sessions will include case study analysis, simulation exercises, numerical problem solving, and presentations. Guided study will include preliminary text readings (defined by lecturer). Additional material will also be emailed by presenters. This module gives a broad introduction to microeconomics, which analyses how individual markets work – how prices are set and resources are allocated in an economy in the context of Trade.

Indicative Content

Topic	Coverage	No. of Lectures
Globalization	a. Introduction to Globalization; b. Features of globalization; c. Measurement of globalization, d. Effects of globalization e. International Trade and FDI, f. Small and medium enterprises in global trade.	6

Theory of international trade	a.Basis of international trade, b.Rationale for free trade, c. Factor mobility d. Balance of trade and Balance of payments e. Exchange rate	5
Government and international business	a. Rationale for interventions in International Trade b. Social, Political, Legal and Cultural factors affecting international business, c.Instruments of government interventions: Tariff and Non-tariff barriers, d.Trade Blocks	6
International trade practices in India	a. EXIM Policy, b. Foreign Trade Policy, c. Export Import incentives, d. Trade Promotion Bodies and Councils: FIPB, ECGC, APEDA	5
International Trade and global institutions	a. WTO, b. UNCTAD, c. IMF	3

Recommended Readings:

- Swami (Dr.) Parthasarathy: 2010: Global Trade in New Millennium: 2nd edition
- Krugman, P & Obsfield, Maurice: International Economics
- Paul A. Samuelson and William D. Nordhaus, Tata McGraw Hill Publishing Company Ltd., 18th Edition, 2008 (Chapter-15: Comparative advantage and protectionism; Chapter-29: Exchange rates and the international financial system).
- International Marketing: Analysis and Strategy Sak Onkvisit, Johan J. Shaw / PHI
- Global Marketing Management Warren J Keegan/ PHI

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title: **Strategic and Transformational IT (ERP)**
Program: MBA (Trimester)
Term: III
Credits: 3

Time required in terms of Student Learning:

Learning	Hours
Contact	25
Guided study	25
Projects and Assignments	15
Assessment	10
Total	**75**

MODULE OBJECTIVE

- Enterprise resource planning (ERP) is an integrated computer-based system used to manage internal and external resources including tangible assets, financial resources, materials, and human resources. It is a software architecture whose purpose is to facilitate the flow of information between all business functions inside the boundaries of the organization and manage the connections to outside stakeholders. Built on a centralized database and normally utilizing a common computing platform, ERP systems consolidate all business operations into a uniform and enterprise wide system environment.

- ERP Systems centralize the data in one place. Benefits of this include:

  - Eliminates the problem of synchronizing changes between multiple systems - consolidation of finance, marketing and sales, human resource, and manufacturing applications
  - Permits control of business processes that cross functional boundaries
  - Provides top-down view of the enterprise (no "islands of information"), real time information is available to management anywhere, anytime to make proper decisions.
  - ERP reduces the risk of loss of sensitive data by consolidating multiple permissions and security models into a single structure.
  - Shorten production lead-time and delivery time
  - Facilitating business learning, empowering, and building common visions

Teaching/Learning Approach

The students will learn through a combination of face - to- face contact and guided study. Personal contact sessions will include Presentations, Case Study analysis and Quizzes.
Guided study will include text readings and the use of a wide range internet based resources.

Indicative Content:

Topic	Coverage	Hours
Business Processes and Information System	• Concept of Business Process: Organisations – Functional and Process View, Business Processes and Enterprise Information Systems	4

	• Important Processes: Procurement Process, Fulfillment Process, Production Process- Role, Steps, Key Data, Document, and information flows associated with each process • End-to end integrated process • Users should be able to access any information in the system without needed integration work on the part of the IS department.	
Functional Modules	• Human Capital Management • Financial Accounting • Managerial Accounting (Controlling) • Production Planning and Execution • Material Management • Sales and Distribution	2
Human Capital Management Perspective	• Recruiting and Talent Management • Enterprise Learning Management • Performance Management • Compensation Management	3
Financial Management Systems	• Financial and Management Reporting • Planning Budgeting and Forecasting • Cost and Profitability Management • Working Capital and Cash flow Management • Payment Behavioural Analysis	4
Operations and Operations Support Management Perspective	• Procurement • Inventory and Warehousing Management • Manufacturing • Transportation • Sales Order Management • Customer Service • Life Cycle Data Management • Program and Data Management • Quality Management • Enterprise Asset Management	5
Sales and Distribution	• Process • Pricing • Creating of Office Letter Schedule	2
Key Issues and Consultants	• Concept Selling • IT Infrastructure • ERP Culture • Implementation Issues • Resistance to Change • Public Service and Organisation (PSO) Project • ERP Selection Issues • Return on Investment • Pre and Post Implementation Issues • Role of Consultants • Key Consultants in India	5

Recommended Text Books:

1. Concepts in ERP – Monk & Wagner
2. ERP Concepts and practice – Garg and Vekat Krishnan
3. Enterprise Resource Planning – Summer Mary
4. Re-engineering Management – J. Harper Champy
5. Business Process Re-engineering – M.S. Jayaraman
6. ERP – Ptak, Carol A. & Eli

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SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : Business Ethics and Corporate Governance
Programme : MBA (Trimester)
Trimester : III
Credits : 3

Time required in terms of Student Learning:

Learning	Hours
Contact	**25**
Guided study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Aim and Objectives:
To help students understand the increasing role of ethics and regulation in business activity to facilitate business development and also the complementary role of the corporate world and civil society in mitigating the adverse effects of failure of market and the corporate world as well .

Upon successful completion of this course, students will be able to:

- Be aware of the significance of ethical behavior and regulation of business activity when market fails to correct certain macroeconomic imbalances and understand the nature and causes
  Infrastructure sector.
- Understand the complementary role of the Board of Directors and the stakeholders in mitigating the adverse effects of lack of transparency and accountability in the system.
- Appreciate the importance of role of public-private partnership and also of active involvement of stakeholders in developing a policy for sustainable development.

Teaching and Learning Approach:
Students will learn through a combination of face-to-face contact and guided study. Personal contact sessions will include case study analysis and presentations. Additional material will also be emailed to students.

Guided Study:
Guided study will include text readings, articles on contemporary issues in the corporate governance, assignments, case analysis and power point presentations.

Assessment:
Assessment of the student's will be based on test, end term examination and continuous assessment with due weightage to class participation, assignments and presentations.

***Indicative contents**:*

Topic	**Coverage**	**No. of lectures**
Business Ethics:	Introduction to Business Ethics, Ethics, Morals & Values, Concepts of Utilitarianism and Universalism – Theory of rights, theory of Justice – Virtue ethics – ethics of care – Law and Ethics - The Nature of Ethics in Management- Business Standards and Values - Value Orientation of the Firm.	**4**
Typical Problems in Business Ethics:	• Environmental Pollution & Society - Marketing Ethics (in Products, Pricing, Promotion and Place) and Consumer protection • Ethics in Human Resources management (Recruitment and promotion policies, Working Conditions,, Down Sizing Workforce), Ethical issues at the top management • Ethics in financial markets and investor protection – Ethical responsibility towards competitors and business partners.	**4**
Corporate Social Responsibility:	A Historical Perspective from Industrial Revolution to Social Activism – Current CSR practices of the firms in India and abroad.	**2**
Complexity of Ethical Issues:	• **Ethical Dilemma:** Conflicts in decision making from ethical and economic point of view- Ethical Dilemma - Solving ethical dilemma Managerial integrity and decision making. • **Ethical Leadership:** Personal Integrity and self development – wisdom based leadership.	**2**
Corporate Governance:	• **Background:** History of Corporate form and models - Corporate Objectives and goals, Ownership pattern – Issues in managing public limited firms – Agency problems. • **Nature & Evolution of Corporate Governance:** Global and National Perspectives – Global Corporate Governance models - Anglo American and Relationship model (Germany, Japan and France)- Claims of Various Stakeholders - Why governance – Changes in eighties	**6**
Corporate Governance Mechanism	• **Internal Corporate Governance Mechanism:** Board of Directors— Functional Committees of Board; Code of conduct, whistle blowers. • **External Corporate Governance Mechanism**: Regulators, Gate keepers, Institutional Investors, etc.	**3**
Corporate Governance in India:	• Corporate form in India 50s to 90s • Developments in Corporate Governance in India in	**4**

	nineties and 2000s • Corporate governance in practice in India.	
TOTAL		**25**

Recommended Readings:

1. Michael F. Kraft and Scott R. Furlong, ***"Public Policy"*** (policies, analysis and alternatives) CQ Press, Washington D.C., 2007.
2. The Institute of Company Secretaries of India (ICSI), "***Corporate governance Framework***" Taxman publications, New Delhi, 2009.
3. **Business Ethics & Corporate Governance : An Indian Perspective-A.C. Fernando-Pearson Education**
4. **Business Ethics-Concepts &Cases-Velasquez,M.G. – PHI 2005**
5. **Corporate Governance- Monks, R / Minow ,N Blackwell 2008**

SCHOOL OF BUSINESS STUDIES, SHARDA UNIVERSITY
COURSE MODULE FOR MBA (TRIMESTER BASED SYSTEM)

Module Title : **PRODUCTION, OPERATIONS MANAGEMENT & TQM**
Program : MBA (Trimester)
Term : III
Credits : 3

Time required in terms of Student Learning:

Learning	Hours
Contact	**25**
Guided Study	**25**
Projects and Assignments	**15**
Assessment	**10**
Total	**75**

Objective of the paper:
The objective of this paper is to help the students to become effective managers in the competitive global environment. After studying it the students placed in various organizations whether manufacturing or service are supposed to take care of the very basic unit of the work that is process. They need to accept the challenge of both managing and understanding the interrelatedness of the enterprise wide activities.

Indicative Content

Topics	Cover	Lectures
UNIT 1	1.**Introduction** Meaning and function of Production Management, Production system Production Organization Chart, Decision Making in Production Operation, Production Departments with various other departments and their importance. 2. **Strategies** Responsibility of Production Manger. Interdependencies of Operation strategies and decision making produce to stock and produce to order strategies, concept of using mixed strategies, advantages of having mixed strategies.	7
UNIT 2	3. **Long term planning** Facility location and facility layout. Factors affecting the location of facility, different types of layouts, product focused, process Focused, cellular and mixed layouts. Introduction to the methods for determining the location and layout of a facility. 4. **Intermediate term planning** Capacities Planning, aggregate planning, hire and fire strategy etc. Identification and segregation of the operations based on the strategy selected.	7

	5. **Shop floor control** Resource planning, sequencing and scheduling, concept of JIT, manufacturing and assembly line balancing, preparation of Gantt Chart.	
UNIT3	6. **Inventory Management** Inventory definition, types and models, managing the inventory, classification of inventories, Master Production Schedule, Material Requirements Planning, ERP. 7. **Work Study & Productivity** Productivity improving techniques, Cost reduction approach, Work and Method study, Work Order, Production Control and its importance	7
UNIT 4	8. **Quality Concepts** Production Quality Concepts and Internal Customer Approach, Introduction to the tools of quality management. 9. **Safety Management** Evolution of safety concepts, Electrical & Chemical hazards, ionizing and non ionizing Radiation, Personal protection, Material handling and shop floor design concepts, Environmental safety, fire prevention, introduction to OHSAS standards.	4

Books for Reference:

1. Modern Production/Operation Management Buffa
2. Production/Operation Management Concepts E. Adam& J. Albert Prentice Hall.
3. Theory & Practice of Production Operation Management S.N.Chary
4. Safety Management Grimaldi Simonds
5. Operations Management Russell & Taylor

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Executive MBA Program (Trimester Based)

Course and Credit Structure

Trimester 1	**Credits**	**Trimester 2**	**Credits**	**Trimester 3**	**Credits**	**Trimester 4 (Summer Term)**	**Credits**	**Trimester 5**	**Credits**	**Trimester 6**	**Credits**
C-101 GENERAL MANAGEMENT AND ORGANIZATIONAL BEHAVIOR	3	C-201 BUSINESS ENVIRONMENT	3	C-301 SUPPLY CHAIN MANAGEMENT	3	C-401 PROJECT PREPARATION AND WRITING	6	C-501 STRATEGIC MARKETING	3	C-601 LIVE PROJECT – (SPECILIZATION)	15
C-102 MANAGEMENT ACCOUNTING	3	C-202 HUMAN RESOURCE MANAGEMENT	3	C-302 STRATEGIC MANAGEMENT	3	C-402 CROSS CULTURAL DIVERSITY AND TEAM BUILDING	3	C-502 TECHNOLOGY MANAGEMENT, INNOVATION, IPR & ENTREPRENEURSHIP	3		
C-103 MARKETING MANAGEMENT	3	C-203 FINANCIAL MANAGEMENT AND POLICY	3	C-303 STRATEGIC AND TRANSFORMATIONAL IT (ERP)	3	*C-403 INTERNATIONAL BUSINESS*	3	C-503 *ELECTIVE-1 SPECIALIZATION*	3		
C-104 QUANTITATIVE TECHNIQUES FOR BUSINESS DECISIONS	3	C-204 BUSINESS RESEARCH METHODOLOGY	3	C-304 PRODUCTION OPERATIONS AND TQM	3	C-404 SEMINARS IN MANAGEMENT (ELECTIVE EVENT BASED)	3	C-504 *ELECTIVE-2 SPECIALIZATION*	3		
C-105 MANAGERIAL ECONOMICS	3	C-205 WRITTEN ANALYSIS AND CASES	3	C-305 BUSINESS COMMUNICATION	3			C-505 SEMINARS IN MANAGEMENT (SPECIALIZATION)	3		
TOTAL	**15**		**15**		**15**		**15**		**15**		**15**

Elective Courses:

FINANCE
FIN401-FINANCIAL MARKETS & INSTITUTIONS
FIN402-SECURITY ANALYSIS & PORTFOLIO MANAGEMENT
FIN403-STRATEGIC FINANCIAL MANAGEMENT
FIN404-TAX PLANNING & MANAGEMENT
FIN405-FINANCIAL DERIVATIVES & RISK MANAGEMENT
FIN406-PROJECT AND INFRASTRUCTURE FINANCE
FIN407-INTERNATIONAL FINANCIAL MANAGEMENT
FIN408-MERGERS, ACQUISITION & CORPORATE RESTRUCTURING
FIN409-FINANCIAL SERVICES
FIN410-MICRO FINANCE & RURAL CREDIT
HR
HR401-INDUSTRIAL RELATIONS AND LABOUR LAWS MANAGEMENT
HR402-EMPLOYEE TRAINING & DEVELOPMENT
HR403-ORGANISATIONAL DEVELOPMENT & CHANGE
HR404-STRESS MANAGEMENT & WORKLIFE BALANCE
HR405-INTERNATIONAL HRM & DIVERSITY MANAGEMENT
HR406-COMPENSATION MANAGEMENT
HR407-NEGOTIATION AND COUNSELLING
HR408-STRATEGIC HRM
HR409-PERFORMANCE MANAGEMENT, COMPETENCY MAPPING & LEADERSHIP DEVELOPMENT
HR410-HR SYSTEMS AND AUDIT
MARKETING
MKT401-MARKETING OF SERVICES
MKT402-ADVERTISING MANAGEMENT
MKT403-CUSTOMER RELATIONSHIP MANAGEMENT (CRM)
MKT404-BRAND & PRODUCT MANAGEMENT
MKT405-RETAIL MARKETING
MKT406-SALES & DISTRIBUTION
MKT407-CONSUMER BEHAVIOUR
MKT408-RURAL MARKETING
MKT409-INTERNATIONAL MARKETING
MKT410- BUSINESS MARKETING
OPERATIONS AND SYSTEM MANAGEMENT
OM401-BUSINESS PROCESS RE-ENGINEERING
OM402-BUSINESS INTELLIGENCE
OM403-SOFTWARE ENGINEERING & PROJECT MANAGEMENT
OM404-TOTAL QUALITY MANAGEMENT (TQM)
OM405-INVENTORY MANAGEMENT SYSTEM
OM406-MANUFACTURING PLANNING & CONTROL
OM407-ADVANCE OPERATIONS RESEARCH
OM408-OPERATIONS STRATEGY
OM409-BUSINESS POLICY

NOTE: A course will be offered only if there are substantial numbers of students.

Annexure-XVII of Agenda Item no. 6.16

Equivalence of first year BBA courses of Sharda University with the work done by Chinese students at the Chinese University:

Annexure – 4

SHARDA UNIVERSITY
Beyond Boundaries

School of Business Studies
Office of the Dean

29/02//2012

Sub: Equivalence of first year BBA courses of Sharda University with the work done by Chinese students at the Chinese University

Following Chinese students have approached the University for admission in BBA III term on lateral entry basis.

1. Fankai
2. liu junbo
3. Mao xiaorui
4. liu ming

The Sharda University is in the process of evolving the guidelines for admitting students on lateral entry basis. In the meanwhile, a Committee consisting of the following members examined the courses studied by these students in China in various Universities:

1. Prof. MP Gupta - Chairman
2. Prof. Shalini Sharma - Member
3. Prof. Y.P. Singh - Member
4. Dr. Sharad K Raghuvansh - Member
5. Mr. Mridul Dharwal - Convener

The Committee examined the equivalence of the course work done by them. The courses studied by them as given in their mark sheets were mapped by the committee with the requirement of the courses for the BBA of the Sharda University. The Committee concluded that they could be admitted in second year, but some of the courses which they have not covered should be covered in the second year. An abridged course structure for the remaining terms is enclosed which may be taken up for study and examinations, especially for the purpose of award of BBA degree.

(Prof. MP Gupta) (Prof. Shalini Sharma) (Prof. Y.P. Singh)

(Dr. Sharad K Raghuvansh) (Mr. Mridul Dharwal)

ANNEXURE – I

BBA Course Structure for chinese students (August 2011 to December 2012)

FUNCTIONAL AREA	TERM III	Credit	TERM IV		TERM V	Credit
	Module	CR	Module	CR	Module	CR
Marketing	Consumer Behaviour	4	Advertising and Brand Management	4		
Statistics & Operation Research	Operations Research Techniques	4	Business Research Methods	4	Production and Operations Management- Basics	4
Economics	Features of Indian Economy	4			Economic Environment of Business	4
Human Resource	Managing People at Work	4	Fundamentals of Industrial Relations	4		
Accounting and Finance	Financial Management	4	Business Taxation	4		
			Introduction to Financial Markets	4		
Information Technology	System analysis & design	4				
Law			Corporate Law	4		
General Management					Essentials of International Business	4
					Business policy & Corporate Strategy	4
					Entrepreneurship- Basics	4
Communication	Presentation Applications & Management Skills I	2	Professional Writing & IT Skills	2	International Corporate Etiquettes & Leadership	2
Projects & Viva Voce					Project report & comprehensive viva voce	5
Non- Credit course	Basic English language I		Basic English language II		Advanced English Language	
Total Credits		26		26		27

Annexure-XVIII of Agenda Item no. 6.17

SHARDA UNIVERSITY

SCHOOL OF MEDICAL SCIENCES AND RESEARACH

SHARDA HOSPITAL, GREATER NOIDA

COURSE OF STUDIES (SYLLABUS)

AND

SCHEME OF EXAMINATION

FOR

B.Sc. MEDICAL IMAGING TECHNOLOGY (RADIOGRAPHY) COURSE

INTRODUCTION

Medical Science has made tremendous advances in last two decades. Newer diagnostic and therapeutic modalities like ultrasound; CT scan, MRI, PET scan, etc. are developing at a rapid pace. It is possible to impart this knowledge to the medical students. However, there is acute shortage of supportive technical staff familiar with the newer techniques. X-ray technologist plays an important role in helping the radiologist to make a diagnosis by providing good quality films and helping in technology expansion in medical care, hence there is increasing requirement of trained radiographers and supervisors to meet the expectations. Thus more and more job opportunities shall be available to the persons trained in X-ray and imaging technology.

With improving standards of medical care and for further up gradation, there is a need for highly qualified imaging professionals in this field all over the country. Further, placements are being solicited by the multinational companies for the bright technologist and highly skilled students as application experts specializing in different field. Further, with many upcoming institutions for providing training for radiographers, there shall be increasing requirement for tutors. The B.Sc. (M.T) course in medical technology (Radiography) is aimed at meeting this rising demand as well as at enhancing the quality of health care.

OBJECTIVES

1. This is a vocational educational technician course in X-ray technology which will fulfill need of trained manpower in the field of health services.
2. This medical technology radiography course will ensure & help better patient care & diagnosing the patient in accurate manner & direction to achieve optimum result by the medical professionals.
3. To enhance the standard of knowledge and experience of the students in the field of medical technology (Radiography) and to update them with the newer developments taking place in the field of Radio diagnosis.
4. The students will be aware and conversant with latest sophisticated modern imaging modalities such as CT scan, MRI and PET Scan etc.
5. To make the students aware of various radiations safety measures meant for staff members and general public.

COURSE: Course will be of THREE YEARS Duration

Marks

1st Year

3 Lectures with 1 Practical

(Demonstration) per week

		Hrs.	External	Internal	Internal Assessment
1.	Gross Radiological & surface Anatomy of human body	40	40	40	20
2.	Physiology in Radiography	50	40	40	20
3.	Basic Physics, electricity and Magnetism, Radiation physics	80	40	40	20

No practical's and oral will be held in 1 & 2 Practical and oral will be of 100 marks for (3)

Above (80+20 internal assessment.)

2nd Year

3Lectures per week, 1 Practical

(Demonstration) per week

1.	Dark Room procedure	100	40	40	20
2.	Hospital practice and care of the patients.	30	40	40	20
3.	Apparatus for radiography	30	40	40	20

Practical including oral will be held in Dark Room Procedures carrying 100 marks (80 + Internal assessment of 20 marks).

3rd Year

3 Lectures per week, 1 practical

(Demonstration) per week.

1.	Radiographic technique of	40	40	40	20

Bone and joints.				
2. Radiographic Techniques (Spl.)	60	40	40	20
3Recent advances in Imaging and contrast media	40	40	40	20
4. Reduction Hazards and its Protection and planning of the department.	20	40	40	20

Practical including oral will be held on radiological techniques of bones and joints carrying 100 marks (80+ internal assessment of 20 marks).

Note:- The students will remain in X-Ray Room/ Dark Room etc. in hospital working hours and will be guided for practical training.

1. No student shall be permitted to join 2nd year course until he has passed in the first year subjects for which he/she will be permitted not more then four chances (Including supplementary examinations and whether appeared or not appeared).
2. 75% attendance is compulsory with 30 days vacation per year.

Note: - student must secure 50% in theory and 50% marks in practical separately in each subject before they could be declared successful.

(5) Board of Examiners

(1.) There shall be one internal and one external examiner in Anatomy and Physiology examinations for theory only during 1st year.

(2.) There should be two internal and two external examiners (from Radiology) for rest of the examinations during 1st, 2nd & 3rd years who will examine the theory as well as practical including oral. (one of the internal examiner will always be the Head of the Department and the other internal examiner will be amongst the rest of the faculty member by rotation) in the department.

(3.) The practical examinations of 1st, 2nd & 3rd years should be held continuously on 3 days with the same internal and external examiners appointed for each practical examination.

(4.) Paper I of theory is each subject in each year will be set jointly by the internal examiners and paper II of theory in each subject in each year will be set by the external examiners. All the theory papers however will be moderated by the chief Co- ordinator of the Course / Head of the Department of Radiology and imaging of SMS&R.

(5.) Schedule of Examinations.

Annual: 1st, 2nd and 3rd year. July 15th onward every year.

Supplementary: There shall be Supplementary Examination within 4-6 Wks after declaration of the Result of the Annual Examination.

PROPOSED SYLLABUS OF B.Sc (MEDICAL IMAGING TECHNOLOGY) (RADIOGRAPHY)

1st Year

1. Gross Radiological and surface Anatomy of human body.
2. Physiology in Radiography.
3. Basic Electricity and Magnetism and Radiation Physics.

2nd Year.

1. Dark Room Procedures.
2. Hospital Practice and care of the patients.
3. Apparatus for Radiography.

3rd Year.

1. Radiographic Techniques of Bones & Joints.
2. Radiographic Techniques (Special).
3. Recent advances in Imaging &Contrast Media.
4. Radiation Hazard and its protection & planning of the department.

PROPOSED DETAILED SYLLABUS OF B.Sc. MEDICAL IMAGING TECHNOLOGY (RADIOGRAPHY) COURSE.

1st Year.

1. **Gross Anatomy, Radiological and Surface Anatomy of Human body.**

Introduction: Anatomy of human body as a whole, structure of cell and tissues of body: Epithelial tissue, connective tissue, muscle tissue and nervous tissue.

Anatomy of the various systems of body:

Skeletal system :

-Classification of bones - Axial skeleton , Appendicular skeleton , Bones - structure and functions , formation of bone, growth of skeleton, centers of ossification , fracture and dislocation, diseases of the bones , Radiological and Surface Anatomy.

-Joints: Classification of joints with examples , anatomy of various joints of head and neck, trunk and limbs

Muscular system: Types of muscles, Position and actions of chief muscles of the body

Cardiovascular system: Anatomy of pericardium and heart, blood vessels, types of blood circulation

Respiratory system: Nasal passages and para -nasal sinuses, pharynx and larynx, trachea, bronchi, lungs and pleura

Gastrointestinal system: parts of GIT ,oral cavity ,salivary glands,oesophagus,stomach,small and large intestine,liver,gall bladder ,pancreas .

Urinary system: kidney, Ureters, urinary bladder and urethra

Reproductive system: Parts of male and female reproductive system, location, functions, mammary gland

Endocrine system: location, structure and functions of Pituitary, Thyroid, Parathyroid, Suprarenal and Pancreas

Nervous system and sense organs: Structure and function of Neuron, subdivisions of nervous system: central and autonomic nervous system- Parts, structure and functions, ventricles of the Brain, CSF circulation

Sense Organs: Structure and function of the eye, ear, tongue, nose, skin

Surface landmarks and topography of organs on the surface of body for radiographic positioning.

2. Physiology for Radiography:-

Blood – its composition and function – nerve tissue- muscular tissue and types. Abnormalities in tissue-ulceration-sepsis- asepsis and antisepsis- the nature of **neoplasm**- common tumors- malignant tumors- dissemination of malignancy primary and secondary spread.

Respiratory system – Nasal passages and Para nasal sinuses- pharynx and larynx- Trachea, Bronchus and lungs. The pleura- nature and functions of respiration- common terms relating to disease and conditions of this system. Lymphatic system- lymph and tissue fluid- main glands and drainage areas in the lymphatic system- Lymphoid tissue and the tonsils.

Reticulo-endothelial system- liver and spleen- bone narrow, Life cycle of red and white corpuscles of the blood,

Alimentary systems- function of mouth, tongue and teeth, salivary glands- pharynx and esophagus- Stomach – small intestine (jejunum)- large intestine (colon)- Liver and Biliary tract- pancreas- functions of the alimentary system – digestion and absorption of food- metabolism- common terms used in connection with abnormalities of this system.

Urinary tract- kidney, Ureters and bladder- urethra – urinary Excretion.

Reproductive system- Male genitalia- Female genitalia, Mammary glands- Menstruation, pregnancy and lactation – common terms related to abnormalities of this system.

Ductless glands (Endocrine system)- Anatomical location of pituitary, thyroid, parathyroid, adrenal, thymus, pancreas and gonads – there function ,common terms related to this system.

Nervous system- main subdivisions, lobes and ventricles of the brain- spinal cord- meninges and cerebro- spinal fluid- common terms used in abnormalities of this system. **Organs of senses**, Structure and function of the eye – Structure and function of the ear.

2. **Basic physics, Electricity and Magnetism & Radiation Physics :**

Revision of mathematics related to radiography measurements and unit of C.G.S and M.K.S. system. Electrical charges, potential differences, current and resistance. Ohms low for electrical circuits, direct current. Conductor, insulator and semi- conductor. Electrical power- ammeters and voltmeters. Electromagnetism Electromagnetic induction -self and mutual. Production of X-rays,A.C. Generators. Transformers- losses, construction regulations and types used in X-Ray apparatus . Thermionic emission, vacuum, diode- variation of tubes current and anode voltage. The diode as rectifier and as an X-Ray tube. Types of rectification and methods used in diagnosis and therapy, interaction of X-Ray with matter.

X-Ray tube- diagnostic- type, method of heat dissipation, failure measurement in Radiation exposure. Scattered Radiation and method to reduce it. Inverse square law and grid.

3. **Dark Room Procedure**

Fundamental of photographic emulsion, light sensitive materials, construction and emulsion formation. Formation of latent image. Chemical development of the latent Image. Storage of X-Ray films and its transportation. Type of photography emulsion size Of grain – speed of the films. Sensitometry – evaluation of emulsion characteristic – Density. Contrast and latitude – basic fog- characteristic curve Lumiscence – fluorescence and phosphorescence. Fluorescent screens and cassettes. Intensification factor. Size of crystals, reciprocity failure,. Cassettes- test for cassettes for screen contrast and high leakage. Construction & types of films (X-rays, material etc.).

X-Ray Developer-

Agents- function and construction of the developer – standardization by time and temperature process of development- latitude- exhaustion of developer – regeneration by replacement.

Types of developer used in radiograph- powder and liquid concentrates- standard high contrast and high energy developers- Ultra rapid development methods- increased temperature. Used of replenisher.

Fixation- fixing agents- constituents of radiographic fixer and function of the chemicals fixation time exhaustion of fixer- silver recovery combined with generation of fixer (electrolysis) - other silver recovery methods- rapid fixer. Film rinse- acid stop bath- washing of films etc.

Practical processing- preparation of solutions- water supply mixing vessels- order of mixing chemicals- stock, solutions and storage- storage of dry chemicals and liquid, concentrates. Processing apparatus – temperature control- immersion heaters- thermostat – ice cooling and refrigeration cooling. Theatre processing- ultra- rapid processing – dish and small tank techniques- , type and care of hangers.

Technical and processing faults- fog, static pressure, screen artifacts.

The X-Ray dark room- minimum dimensions- services required – planning and layout – light proofing- ventilation- radiation protection- chemical proof materials – Bench design, film hoppers, film markers, hanger location- Location of processing unit- Pass box, fixer or wash tank- Illumination and testing of illumination- separate drying room with drying cabinets- wet of dry viewing rooms following manual of automatic processing rapid drying apparatus- effects of circulation and layout planning of efficiency.

The radiographic image- effects of exposure factors on contrast details and image sharpness- relationship between kilovoltage and exposure time and tube current (mAs)- effects of distance, filtration, collimation, screens, grids, film speed developers and processing techniques.

Presentation of the radiograph- identification – orientation- technical information about all types of the Films including dental films- use of lead letters and numbers-

Accessories- viewing boxes- magnifier- high intensity localized viewers- projectors and viewing screens for miniature and cineradiography – films tremors- corner- dental mounts, films, films envelopes- filling system and units- stores viewers.
Fluorescent screen photography- photofluorography and cineradiography and cineradiography- optical principles lenses, speed, focal length, depth of field function of the diaphragm- focusing- equipment for photofluorography (Radiophotography, miniature, radiography)- Conventional lens units- mirror lens units- Cassettes types- film magazines – manual and automatic operation- Automatic exposure control- optical identification devices- safety relays and interlocks – independent generators – design of static and mobile units- units for battery operation- Battery ("reservoir" units).
Fluorescent screen type- spectral emission for maximum photographic efficiency- lens resolution and colour sensitivity- halation, radiographie technique and its role in preventive epidemiological and diagnostic. System – Exposure techniques to ensure uniformity with and without automatic exposure control – Special protective measures- viewing and projection- filling system- records- organization of surveys.

4. **Hospital Practice and Care of the Patients :**

Hospital staffing and administration- records- professional ethics in attitudes to patients, Cooperation with other staff and departments. Departmental organization. Handling of the patients- moving of injured patient Normal pulse, temperature and respiration Preparation of the patients for general and special examinations. Supervision of patients undergoing special examinations.

Administration of Enemas- aseptic and sterile procedures. Use of opaque media. Trolley setting for special X-Ray examinations.

5. **Apparatus of Radiography :Principle and construction of X-ray and Imaging Equipments.**

Basic circuits of X-Ray machine, construction and functioning of each part, component. Construction and function of imaging equipment like Ultrasound, CR; DR; C.T. Scan and MRI etc.

6. **Radiographic Technique of Bones and Joints.**

Individual bones of skeleton system of human body and its different projections. Special projection, whenever required and indicated as in skull including petrous, , oral, mastoids, nasal bone, maxilla, mandible, T.M. Joint, optic foramina, teeth, intra oral and extra oral projection- occlusal view.
Projection for scaphoid, shoulder joint, sternum. S.I. Joint, Hip joint, patella, calcaneum, lordotic view chest, Apicogram.

7. **Radiographic Techniques (Special)**

Salivary glands- routine projection for calculi- sialography with opaque media, Macro radiography, general and selective abdominal angiography, peripheral angiography, cerebral angiography, venograms with valsalvamanoeuvre.

Respiratory system- Upper respiratory tract- Naso- pharynx- larynx- Trachea- Barium swallow with valsalva manoeuvre – thyroid and parathyroid glands – bronchus- Tomographic techniques.

Lungs- Routine projection- evaluation of unilateral density – exposure on inspiration and expiration-Valsalva and Muller manoeuvres- Pleura- Techniques to demonstrate fluid levels, effusions and adhesions – oblique., lordotic and decubitous A.P. and Lateral projections- pneumothorax, expiation and inspiration.

Diaphragmatic excretion – double exposure technique- fluoroscopy, Mediastinum – routine projections.

Bronchography – danger of anesthesia of larynx- Inhibition of coughing- methods of introduction of opaque media- positioning and technique during the introduction of media.

Genito- Urinary system- plain film examination K.U.B- Differentiation of opacities especially in Right hypochondrium, Erect, Lateral, double exposure on inspiration and expiration ; Pyelography – intravenous pyelography,Drip infusion pyelography – pyelography in children.

Use or non- use of compression- Trendelenberg position ,High doss technique- contrast media to be used and quantities to be needed. Supplementary techniques- Retrograde pyelography- position and identification of ureteric catheters.

Cystography – Introduction of the media- exposure in relaxed and straining mictruition – control by image intensifier and cineradiography- demonstration of fistulae, post micturation radiographs- uretherography- excretory or retrograde technique.

Obstetrics and gynecology- pregnancy- techniques for evaluation of foetal development, maturity, abnormality, position and multiplicity – placentogtaphy - use of compensating filters- contrast media and soft tissue techniques – cystography and arteriography – pelvimetry - consideration of radiation hazard – Cephalometry – Hystero- salpingography – preparation of patient- Alternative injection procedures – Radiation Hazards in Obstetric and Gynecological radiography.

Central nervous system- Routine projections for skull and spine- ventriculography and encephography- Injection of contrast media- film series to cover all ventricular outlines- Central angiography, Myelography – methods of contrast injection.

Alimentary system - Barium swallow , Pharynx and esophagus- contrast technique with valsalva maneuver – fistula , barium meal procedure for fluoroscopic examination of stomach, jejunum and colon – appropriate timing- Diaphragmatic hernia- Post – operative examinations –the barium meal follow through – plain film, erect, P.A., decubitus for abdominal obstruction. Barium enema- preparation of the patient- Administration of opaque medium- routine projections under fluoroscopic control, - double contrast enema.

Biliary system- Routine projections for plain films, differentiation of opacities in right hypochondrium , Respiratory movements. Oral cholecystography – preparation of the patient- advice on taking of oral opaque medium- reasons for non- appearance of opaque medium in system- Intravenous cholecystography (I.V.C) Action of fatty meal- direct and indirect cholangiography- Demonstration of hepatic ducts.

Liver and spleen- Peumoperitoneum- fluoroscopy and radiography of diaphragmatic excursion – selective Aortogram – splenoPortography.

Salivary glands- routine projections- sialography.

Arthography – media for visualizing joint space- asepsis, special projections.

Sinography- tracing of fistulae and inflammatory conditions by opaque media and fluoroscopic control.

Lymphatic system- soft tissue differentiation for regions concerned- calcification of glands- technique for lymphography with colour tracer and opaque media.

Tomography- Advantages of various movement, linear, circular elliptical, hypocycloidal- Basic of Tomographic principles- effects of operational angle, F.F.D., vibration blur, magnification- Estimation of relevant layer thickness and localization of required area by plain films and fluoroscopy- sequential tomography- Horizontal tomography- simultaneous multisession tomography.

Fluoroscopy- general considerations of the role of the radiographer- dose hazards- limitation of K.V., mA. Focus – skin distance. Fluoroscopic timer- radiation protection to staff during fluoroscopy and associated examinations.

Stereography- Principals involved- Tube shift in relation to patient- Stereoscopic apparatus for viewing and orientation of films in relation to viewing method correct marking of stereographs.

Soft tissue techniques- non-screen techniques- simultaneous screen and non-screen technique- Mammography.

High voltage technique General principals relationship to patient dose- change in contrast, range and detail elimination of scatter- Accessories for H.V. technique- radiographic factors.

Localization of foreign bodies- necessity for removal of all clothing and other opaque objects from the region to be examined.

Techniques for intraocular F.B. Technique for swallowed bones and obstructions to barium swallow- Techniques to locate non- opaque F.B- Technique for inhaled F.B.

8. **Recent advances in Imaging and Contrast Media :**

Radio Nuclide Scintigraphy, C.T. Scanning, Ultrasound, MRI,PET,, Digital Radiography, Contrast Media, types properties, reactions and commonly used in diagnostic radiology.

9. **Radiation hazards and its protections and planning of the department.**

Introduction, Radiation Hazards and Protection, principles and methods to reduce in various diagnostic X-Ray procedures, design, locations, layout, room size, shielding, illumination, control panels, waiting area, choice of equipment.

Wards- mobile and domiciliary Radiography- Electrical supply. Radiation protection cooperation with staff and care of ill patients, special considerations of patients having radioactive sources in the body.

Operating theatre techniques- revision of procedure in collaboration with theatre staff -checking of mains supply and function of apparatus and selection of exposure factors prior to examination. Asepsis in technique- protection- radio processing techniques.

Planning of Radiology Department, rating of X-Ray tubes.

FEE STRUCTURE (ADMISSION, EXAMINATION ETC.) TO BE DECIDED BY FACULY/UNIVERSITY POST REQUIRED-

1.Tutor-One- Qualification- M.Sc Medical Imaging Technology with three years experience working in a teaching institution running these courses/B.Sc Medical Imaging Technology with 8 years experience working in teaching institution running these courses.

2. S.T.A. One

3. The teaching post i.e. Assistant Professor and Senior Resident requirement has already been submitted.

Radiation Physics Practicals-

1. To check the congruence between the Radiation field and Optical field with the help of Collimator Test Tool.
2. To check the Alignment of the Radiation beam by using the Beam Alignment Test Tool
3. To test the Grid by using the Grid Alignment Test Tool
4. To find out the size of the Focal Spot by using the Focal Spot Test Tool
5. To test the consistency of the KVp by using Digital KVp Meter.
6. To Verify the Inverse Square Law by using Pocket Dosimeter.
7. To measure the Radiation output of the X-ray Machine using Dosimeter.
8. To check the perpendicularity of the X-ray beam to Image Receptor.
9. To check the consistency of the X-ray Films
10. To Check the Density of the X-ray Film
11. To Check the Leakage of Radiation, if any

Equipment for Radiation Physics Equipment-

1. Sensitometer
2. Densitometer with Soft Ware
3. Personal Dosimeter
4. Radiation Survey Meter
5. Beam Alignment Test Tool
6. Grid Alignment Test Stool
7. Focal Spot Test Tool
8. Collimator Test Tool.

Dark room Practical's

1. To test the temperature of Developer.
2. To test the temperature of the Fixer
3. To test the safe light
4. To test the efficiency of the Intensifying Screen in Cassette
5. Demonstration various Artifacts in processing.
6. To test the significance of Washing of X-ray Films.

Regional Radiography Practical's

To learn the technique, positioning of all parts of the body and different views

Annexure-XIX of Agenda Item no. 6.18

School of Allied Health Sciences,
Sharda University, Greater Noida

B. Sc Medical Laboratory Technology

(Course Structure, Syllabus, Scheme of Examination & Eligibility for Admission)

Eligibility for Admission:

A candidate seeking admission to the Bachelor of Science Degree in Medical Laboratory Technology Courses in the School of Allied Health Sciences shall have passed:
Intermediate/I. Sc/10+2 Examination from a recognized Board

Note:

- The candidate shall have passed individually in each of the principal subjects.

Duration of the course:

- Duration shall be for a period of Three Years including six months of Internship.

Medium of Instruction:

- The medium of instruction and examination shall be in English.

Scheme of Examination:

- There shall be Three Examination one each at the end of 1st, 2nd & 3rd year.

Attendance:

Every candidate should have attended at least 75% of the total number of classes conducted in an academic year from the date of commencement of the term to the last working day as notified by university in each of the subjects prescribed for that year separately in theory and practical. Only such candidates are eligible to appear for the university examinations in their first attempt. Special classes conducted for any purpose shall not be considered for the calculation of percentage of attendance for eligibility. A candidate lacking in prescribed percentage of attendance in any subjects either in theory of practical in the first appearance will not be eligible to appear for the University Examination in that subject.

Internal Assessment (IA): Theory-20 marks.
Practical-20 marks*. [Lab work-06 marks and Record-04 marks]

There shall be a minimum of two periodical tests preferably one in each term in theory and practical of each subject in an academic year. The average marks of the two/three tests will be calculated and reduced to 20. The marks of IA shall be communicated to the University at least 15 days before the commencement of the University examination. The University shall have access to the records of such periodical tests.

If a candidate is absent for any one of the tests due to genuine and satisfactory reasons, such a candidate may be given a re-test within a fortnight.

Subject and hours of teaching for theory and practicals:

The number of hours of teaching theory and practical, subject wise in First Year, Second Year and Third year are shown in Table-I, Table-II and Table-III

Main and subsidiary subjects are common in first year for all the courses in Allied Health Science
The number of hours for teaching theory and practical form main subjects in first, second and Third year are shown in Table-I, II and III.

Table-I Distribution of Teaching Hours in First Year Subjects

Sl. No	Main Subjects	Theory No. of Hours	Practical No. of Hours	Total No. of Hours
1	Human Anatomy	70	20	90
2	Human Physiology	70	20	90
3	Biochemistry-I	70	20	90
4	Pathology-I	70	20	90
5	Microbiology-I	70	20	90
	Total	**350**	**100**	**450**

Table-II Distribution of Teaching Hours in Second Year Subjects

Sl. No	Main Subjects	Theory No. of Hours	Practical No. of Hours	Clinical Posting	Total No. of Hours
3	Biochemistry-II	100	80	170	350
4	Microbiology-II	100	80	170	350
5	Pathology-II	100	80	170	350
	Total	**300**	**240**	**510**	**1050**

Subsidiary Subjects:

1. Human Health & Environmental Science 10 Hours
2. Health Care in Community & Hospital Setting 10 Hours

Table-III Distribution of Teaching Hours in Third Year Subjects

Sl. No	Main Subjects	Theory No. of Hours	Practical No. of Hours	Clinical Posting	Total No. of Hours
3	Biochemistry-III	100	80	170	350
4	Microbiology-III	100	80	170	350
5	Pathology-III	100	80	170	350
	Total	**300**	**240**	**510**	**1050**

Subsidiary Subjects:

1. Research Methodology, Bioethics & Biostatistics 15 Hours
2. Computer Application & Database Managements 15 Hours

9. Schedule of Examination:

The university shall conduct two examinations annually at an interval of not less than 4 to 6 months as notified by the university from time to time. A candidate who satisfies the requirement of attendance, progress and conduct as stipulated by the university shall be eligible to appear for the university examination. Certificate to that effect shall be produced from the Dean of the School along with the application for Examination and the prescribed fee.

10. Scheme of Examination

There shall be three examinations, one each at the end of I, II and III year. Distribution of Subjects and marks for First Year, Second year & Third year University theory and practical Examinations are shown in the Table – IV, V & VI.

First Year Examination:

The University examination for 1st year shall consist of Five Theory Written and Practical Examinations

Second & Third Year Examination:

The University Examination for 2nd and 3rd Year shall consist of the Three Theory Written and Practical Examinations.

Written Examinations:

Consists of 05 papers in the 1st Year, 03 papers in the 2nd Year & 03 papers in the 3rd Year

Practical examination:

Five practical examinations at the end of 1st Year, Three practical examinations, at the end of 2nd Year and Three practical Examinations at the end of the 3rd year

TABLE-IV

Distribution of Subjects and marks for First Year University Theory Examination

A	Main Subjects	Written Paper		I.A. Theory	Total
		Duration	Marks	Marks	Marks
1	Basic Anatomy [Including Histology]	3 Hours	80	20	100
2	Basic Physiology	3 Hours	80	20	100
3	Biochemistry-I	3 Hours	80	20	100
4	Pathology-I	3 Hours	80	20	100
5	Microbiology-I	3 Hours	80	20	100
Note*1 A= Internal Assessment					

Table-V

Distribution of Subjects and marks for Second Year Examination

		Theory				Practicals			
Paper	Subjects	Theory	Viva-voce	IA	Sub Total	Practicals	I.A.	Sub Total	Grand Total
I	Biochemistry- II	100	30	20	150	40	10	50	200
II	Microbiology-II	100	30	20	150	40	10	50	200
III	Pathology -II	100	30	20	150	40	10	50	200

Distribution of Subsidiary Subjects and marks for Second Year Examination-Non-graded

B	Subsidiary Subject**	Duration	Marks	I.A Theory Marks	Total Marks
1	Human Health & Environmental Science	3 hours	80	20	100
2	Health Care in Community & Hospital Setting	3 hours	80	20	100

** Main Subjects shall have University Examination. There shall be no University Examination for Subsidiary subjects

TABLE – VI

Distribution of Subjects and marks for Third Year Examination.

		Theory				Practicals			
Paper	Subjects	Theory	Viva-voce	IA	Paper	Subjects	Theory	Viva-voca	IA
I	Biochemistry III	100	30	20	I	Biochemistry II	100	30	20
II	Microbiology III	100	30	20	II	Microbiology II	100	30	20
III	Pathology III	100	30	20	III	Pathology III	100	30	20

Distribution of Subsidiary Subjects and marks for Third Year Examination- Non-graded

B	Subsidiary Subject**	Duration	Marks	I.A Theory Marks	Total Marks
1	Research Methodology, Bioethics & Biostatistics	3 hours	80	20	100
2	Computer Application & Database Managements	3 hours	80	20	100

14. Distribution of Type of Question and Marks for Various subjects

THEORY

Subjects Having Maximum Marks=100		
Type of Question	**Number of Questions**	**Marks for Each Question**
Essay Type	3	10
Short Essay Type	12 (10×5)	5
Short Answer Type	12 (10×3)	3

Subjects Having Maximum Marks=80		
Type of Question	**Number of Questions**	**Marks for Each Question**
Essay Type	2	10
Short Essay Type	8 (6×5)	5
Short Answer Type	12 (10×3)	3

Subjects Having Maximum Marks=60		
Type of Question	**Number of Questions**	**Marks for Each Question**
Essay Type	2	10
Short Essay Type	7 (5×5)	5
Short Answer Type	7 (5×3)	3

Subjects Having Maximum Marks=50		
Type of Question	**Number of Questions**	**Marks for Each Question**
Essay Type	2	10
Short Essay Type	5 (3×5)	5
Short Answer Type	7 (5×3)	3

Syllabus for First Year B Sc Lab Technology

School of Allied Health Sciences
Sharda University, Greater Noida

ANATOMY

No. of theory classes: 70 hours
No. of practical classes : 20 hours

1. Introduction: human body as a whole
Theory:
Definition of anatomy and its divisions
Terms of location, positions and planes
Cell and its organelles
Epithelium-definition, classification, describe with examples, function
Glands- classification, describe serous & mucous glands with examples
Basic tissues – classification with examples
Practical: Histology of types of epithelium
Histology of serous, mucous & mixed salivary gland

2. Locomotion and support
Theory:
Cartilage – types with example & histology
Bone – Classification, names of bone cells, parts of long bone, microscopy of compact bone, names of all bones, vertebral column, intervertebral disc, fontanelles of fetal skull
Joints – Classification of joints with examples, synovial joint (in detail for radiology)
Muscular system: Classification of muscular tissue & histology
Names of muscles of the body
Practical: Histology of the 3 types of cartilage
Demo of all bones showing parts, radiographs of normal bones & joints
Histology of compact bone (TS & LS)
Demonstration of all muscles of the body
Histology of skeletal (TS & LS), smooth & cardiac muscle

3. Cardiovascular system
Theory:
Heart-size, location, chambers, exterior & interior
Blood supply of heart
Systemic & pulmonary circulation
Branches of aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery
Peripheral pulse

Inferior venacava, portal vein, portosystemic anastomosis
Great saphenous vein
Dural venous sinuses
Lymphatic system- cisterna chyli & thoracic duct
Histology of lymphatic tissues
Names of regional lymphatics, axillary and inguinal lymph nodes in brief
Practical:
Demonstration of heart and vessels in the body
Histology of large artery, medium sized artery & vein, large vein
Microscopic appearance of large artery, medium sized artery & vein, large vein pericardium
Histology of lymph node, spleen, tonsil & thymus
Normal chest radiograph showing heart shadows
Normal angiograms

4. Gastro-intestinal system
Theory:
Parts of GIT, Oral cavity (lip, tongue (with histology), tonsil, dentition, pharynx, salivary glands, Waldeyer's ring)
Oesophagus, stomach, small and large intestine, liver, gall bladder, pancreas
Radiographs of abdomen

5. Respiratory system
Parts of RS, nose, nasal cavity, larynx, trachea, lungs, bronchopulmonary segments
Histology of trachea, lung and pleura
Names of paranasal air sinuses

Practical: Demonstration of parts of respiratory system.
Normal radiographs of chest
Histology of lung and trachea

6. Peritoneum
Theory: Description in brief
Practical: Demonstration of reflections

7. Urinary system
Kidney, ureter, urinary bladder, male and female urethra
Histology of kidney, ureter and urinary bladder
Practical: demonstration of parts of urinary system
Histology of kidney, ureter, urinary bladder
Radiographs of abdomen-IVP, retrograde cystogram

8. Reproductive system
Theory:
Parts of male reproductive system, testis, vas deferens, epididymis, prostate (gross & histology)

Parts of female reproductive system, uterus, fallopian tubes, ovary (gross & histology)
Mammary gland – gross
Practical: demonstration of section of male and female pelves with organs in situ
Histology of testis, vas deferens, epididymis, prostate, uterus, fallopian tubes, ovary
Radiographs of pelvis – hysterosalpingogram

9. Endocrine glands

Theory:

Names of all endocrine glands in detail on pituitary gland, thyroid gland, parathyroid gland, suprarenal glad – (gross & histology)

Practical: Demonstration of the glands
Histology of pituitary, thyroid, parathyroid, suprarenal glands

10. Nervous system

Theory:

Neuron

Classification of NS

Cerebrum, cerebellum, midbrain, pons, medulla oblongata, spinal cord with spinal nerve (gross & histology)

Meninges, Ventricles & cerebrospinal fluid

Names of basal nuclei

Blood supply of brain

Cranial nerves

Sympathetic trunk & names of parasympathetic ganglia

Practical: Histology of peripheral nerve & optic nerve
Demonstration of all plexuses and nerves in the body
Demonstration of all part of brain
Histology of cerebrum, cerebellum, spinal cord

Sensory organs:

Theory:

Skin: Skin-histology
Appendages of skin

Eye: Parts of eye & lacrimal apparatus
Extra-ocular muscles & nerve supply

Ear: parts of ear- external, middle and inner ear and contents

Practical: Histology of thin and thick skin
Demonstration and histology of eyeball
Histology of cornea & retina

Embryology:

Theory:

Spermatogenesis & oogenesis

Ovulation, fertilization

Fetal circulation

Placenta

Internal Assessment

Theory - Average of two exams conducted. 20

Practicals: Record & Lab work* 10

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Anatomy shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	8 (To attempt 6)	6 x 5	30
Short Answer (SA)	12 (To Attempt 10)	10 x 3	30
Total Marks			80

REFERENCE BOOKS

Anatomy

1 William Davis (P) understanding Human Anatomy and Physiology MC Graw Hill

2. Chaursia –A Text book of Anatomy
T.S. Ranganathan – A text book of Human Anatomy

3. Fattana, Human anatomy
(Description and applied)
Saunder's & C P Prism Publishers, Bangalore – 1991

4. ESTER . M. Grishcimer,
Physiology & Anatomy with Practical Considerations, J.P. Lippin Cott. Philadelphia

Syllabus for First Year B Sc Lab Technology

School of Allied Health Sciences
Sharda University, Greater Noida

PHYSIOLOGY

Theory 70 hours
Practical 20hours

Introduction – composition and function of blood
Red blood cells – Erythropoiesis , stages of differentiation function , count physiological Variation.
Haemoglobin –structure , functions , concentration physiological variation
Methods of Estimation of Hb
White blood cells – Production , function, life span, count, differential count
Platelets – Origin, normal count, morphology functions.
Plasma Proteins – Production, concentration , types, albumin, globulin, Fibrinogen, Prothrombin functions.
Haemostasis & Blood coagulation
Haemostasis – Definition, normal haemostasis, clotting factors, mechanism of clotting, disorders of clotting factors.
Blood Bank
Blood groups – ABO system, Rh system
Blood grouping & typing
Crossmatching
Rh system – Rh factor, Rh in compatibility.
Blood transfusion – Indication, universal donor and recipient concept.
Selection criteria of a blood donor. transfusion reactions Anticoagulants – Classification, examplesand uses
Anaemias : Classification – morphological and etilogical. effects of anemia on body
Blood indices – Colour index , MCH, MCV, MCHC
Erythrocyte sedementation Rate (ESR) and Paced cell volume
Normal values, Definition , determination,
Blood Volume -Normal value ,determination of blood volume and regulation of blood volume Body fluid – pH, normal value, regulation and variation
Lymph – lymphoid tissue formation, circulation, composition and function of lymph

Cardiovascular system
Heart – Physiological Anatomy, Nerve supply
Properties of Cardiac muscle,
Cardiac cycle-systole,diastole. Intraventricular pressure curves.
Cardiac Output – only definition
Heart sounds Normal heart sounds Areas of auscultation.
Blood Pressure – Definition, normal value, clinical measurement of blood pressure.
Physiological variations, regulation of heart rate, cardiac shock, hypotension, hypertension.
Pulse – Jugalar, radial pulse, Triple response

Heart sounds – Normal heart sounds, cause characteristics and signification. Heart rate Electrocardiogram (ECG) –significance.
Digestive System - Physiological anatomy of Gastro intestinal tract, Functions of digestive system
Salivary glands Stucture and functions. Deglutination –stages and regulation
Stomach – structure and fuctions
Gastric secretion – Composition function regulation of gastric juice secretion
Pancrease – structure, function, composition, regulation of pancreatic juice
Liver – functions of liver
Bile secretion, composition, function regulation of bile secretion .Bilirubin metabolism types of bilirubin, Vandernberg reaction, Jaundice- types, significance.
Gall bladder – functions
Intestine – small intestine and large intestine
Small intestine –Functions- Digestive, absorption ,movements.
Large intestine – Functions, Digestion and absorption of Carbohydrates,Proteins, Fats,Lipids.Defecation
Respiratory system

Functions of Respiratory system, Physiological Anatomy of Respiratory system, Respiratory tract, Respiratory Muscles, Respiratory organ-lungs, Alveoli, Respiratory membrane, stages of respiration.
Mechanism of normal and rigorous respiration. Forces opposing and favouring expansion of the lungs. Intra pulmonary pleural pressure, surface tension, recoil tendency of the wall. H
Transportation of Respiratory gases :
Transportation of Oxygen : Direction, pressure gradient, Forms of transportation, Oxygenation of Hb. Quantity of Oxygen transported.

Lung volumes and capacities
Regulation of respiration what? Why? How? Mechanisms of Regulation, nervous and chemical regulation. Respiratory centre. Hearing Brier, Reflexes.
Applied Physiology and Respiration : Hypoxia, Cyanosis, Asphyxia, Dyspnea, Dysbarism, Artificial Respiration, Apnoea.
Endocrine System - Definition Classification of Endocrine glands & their Harmones Properties of Harmones .
Thyroid gland hormone – Physiological, Anatomy, Hormone scerated, Physiological function, regulation of secretion. Disorders – hypo and hyper secretion of hormone
Adrenal gland, Adrenal cortex physiologic anatomy of adrenal gland, Adrenal cortex, cortical hormones – functions and regulation
Adrenal medulla – Hormones , regulation and secretion. Functions of Adrenaline and nor adrenaline
Pituitary hormones – Anterior and posterior pituitary hormones, secretion ,function
Pancreas – Hormones of pancreas
Insulin – secretion, regulation ,function and action
Diabetes mellitus – Regulation of blood glucose level
Parathyroid gland – function, action ,regulation of secretion of parathyroid hormone.
Calcitonin – function and action
Special senses

Vision – structure of eye. Function of different parts.
Structure of retina
Hearing structure and function of can mechanism of hearing
Taste – Taste buds functions . Smell physiology, Receptors.
Nervous system
Functions of Nervous system, Neurone structure, classification and properties. Neuroglia, nerve fiber, classification ,conduction of impulses continuous and saltatory. Velocity of impulse transmission and factors affecting. Synapse – structure, types, properties. Receptors – Definition, classification ,properties. Reflex action – unconditioned properties of reflex action. Babinski's sign. Spinal cord nerve tracts. Ascending tracts, Descending tracts –

pyramidal tracts – Extrapyramidal tracts. Functions of Medulla, pons, Hypothalamic disorders. Cerebral cortex lobes and functions, Sensory cortex, Motor cortex,Cerebellum functions of Cerebellum.Basal ganglion-funtions. EEG.
Cerebro Spinal Fluid(CSF) : formation, circulation, properties, composition and functions lumbar puncture.
Autonomic Nervous System : Sympathetic and parasympathetic distribution and functions and comparison of functions.
Excretory System
Excretory organs
Kidneys: Functions of kidneys structural and functional unit nepron, vasarecta, cortical and juxtamedullary nephrons – Comparision, Juxta Glomerular Apparatus –Structure and function. Renal circulation peculiarities.
Mechanism of Urine formation : Ultrafiltration criteria for filtration GFR, Plasma fraction, EFP, factors effecting EFR. Determination of GFR selective reabsorption – sites of reabsorption ,substance reabsorbed, mechanisms of reabsorption Glucose, urea. H + Cl aminoacids etc. TMG, Tubular lead, Renal threshold % of reabsorption of different substances, selective e secretion.
Properties and composition of normal urine, urine output. Abnormal constituents in urine , Mechanism of urine concentration.
Counter – Current Mechanisms ; Micturition, Innervation of Bladder, Cysteurethrogram.
Diuretics : Water, Diuretics, osmotic diuretics, Artificial kidney Renal function tests – plasma clearance Actions of ADH, Aldosterone and PTH on kidneys. Renal function tests
Reproductive system
Function of Reproductive system, Puberty, male reproductive system. Functions of testes, spermatogenesis site, stages, factors influencing semen. Endocrine functions of testes Androgens – Testosterone structure and functions. Female reproducive syustem. Ovulation, menstrual cycle. Physiological changes during pregnancy, pregnancy test. Lactation : Composition of milk factors controlling lactation.
Muscle nerve physiology
Classification of muscle, structure of skeletal muscle, Sarcomere contractile proteins, Neuromuscular junction. Transmission across, Neuromuscular junction. Excitation contraction coupling. Mechanism of muscle contraction muscle tone, fatigue Rigour mortis

Skin -structure and function

Body temperature measurement, Physiological variation, Regulation of body Temperature by physical chemical and nervous mechanisms .Role of Hypothalamus, Hypothermia and fever.

Practicals

Haemoglobinometry
White Blood Cell count
Red Blood Cell count
Determination of Blood Groups
Leishman's staining and Differential WBC count
Determination of packed cell Volume
Erythrocyte sedimentation rate [ESR]
Calculation of Blood indices
Determination of Clotting Time, Bleeding Time
Blood pressure Recording
Auscultation for Heart Sounds
Artificial Respiration
Determination of vital capacity
Internal Assessment

Theory - Average of two exams conducted.	20
Practicals: Record & Lab work*	10

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Physiology shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	8 (To attempt 6)	6 x 5	30
Short Answer (SA)	12 (To Attempt 10)	10 x 3	30
Total Marks			80

REFERENCE BOOKS

Physiology

1. Guyton (Arthur) Text Book of Physiology.
   Latest Ed. Prism publishers
2. Chatterjee(CC) Human Physiology Latest Ed.
   Vol-1, Medical Allied Agency

3. Choudhari (Sujith K) Concise Medical Physiology Latest Ed. New Central
Book,
4. Ganong (William F) Review of Medical
Physiology. Latest Ed . Appleton

1st Year B. Sc Medical Laboratory Technology

BIOCHEMISTRY- I

BIOCHEMISTRY -I

SYLLABUS

Theory classes: 70 Hours
Practical classes: 20 Hours

THEORY

Course description : at the end of the course the student will have to become familiar with laboratory apparatus, Solutions,chemistry of carbohdrates , proteins , lipids, lipoproteins, enzymes, nutritional requirements,vitamins,trace elements,and some basic analytical techniques.

1. Introduction to Laboratory apparatus

Glassware

A. Pipettes- different types (Graduated, volumetric, Pasteur, Automatic etc.,) Calibration of glass pipettes

B. Burettes, Beakers, Petri dishes, depression plates.

C. Flasks - different types ; Volumetric, round bottomed, Erlemeyer conical etc.

D. Funnels – different types (Conical, Buchner, etc.,)

E. Bottles – Reagent bottles – graduated and common, Wash bottles – different type

Specimen bottles, etc.

F. Measuring cylinders, different sizes Porcelain dish.

G. Tubes – Test tubes, centrifuge tubes, test tube draining rack.

H. Cuvettes, significance of cuvettes in colorimeter, cuvettes for visible and UV range,

Cuvette holders

I. Racks – Bottle, Test tube, Pipette

J. Dessicator, Stop watch, rimers, scissors

K. Dispensers – reagent and sample

L. Tripod stand, Wire gauze, Bunsen burner

Any other apparatus which is important and may have been missed should also be covered

Maintenance of lab glass ware and apparatus:

2. Plastic ware in Laboratory

3. Use of quality glass: Significance of borosilicate glass ;

Care and cleaning of glass ware, different cleaning solutions of glassware, Detergents and Chromic acid

Care and cleaning of plastic ware, different cleaning solutions for plastic wares

Instruments (Theory and demonstration) Diagrams to be drawn

A. Water bath: Use, care and maintenance

B. Oven & Incubators : Use, care and maintenance.

C. Water Distillation plant and water deionizers. Use, care and maintenance

D. Refrigerators, cold box, deep freezers – Use, care and maintenance

E. Reflux condenser : Use, care and maintenance

F. Centrifuges (Theory and demonstration) Diagrams to be drawn

Definition, Principle, Svedberg unit, centrifugal force, centrifugal fource(g) rpm, Conversion of g to rpm

and vice versa.

Different types of centrifuges , Use, care and maintenance of centrifuge

G. Laboratory balances [Theory & Practicals) Diagrams to be drawn

Manual balances: Single pan, double pan balance, Direct read out electrical balances.

Use care and maintenance. Guideline to be followed and precautions to be taken while weighing

Weighing different types of chemicals, liquids. Hygroscopic compounds etc.

H. Colorimeter and spectrophotometer (Theory and uses) Diagrams to be drawn

Principle, Parts Diagram.

Use, care and maintenance.

I. pH meter (Theory & practicals) Diagrams to be drawn

principle, parts, Types of electrodes, salt bridge solution.

Use, care and maintenance of pH meter and electrodes

Guidelines to be followed and precautions to be taken while using pH meter

Safety of measurements in Laboratory

Conventional and SI units

Preparation of Solutions

Molecular weight, equivalent weight of elements and compounds, normalit, molarity

Preparation of molar solutions (mole/litre solution) eg: 1 M NaCl, 1 M NaOH, 0.1 M HCl,

Preparation of normal solutions. eg., IN Na2 CO3 , O IN Oxalic acid

Percent solutions. Preparation of different solutions – v/v w/v (solids, liquids and acids)

Conversion of a percent solution into a molar solution

Dilutions

Diluting solutions: eg. Preparation of 0.1 N NaCl from 1 N NaCl etc

Preparing working standard from stock standard, Body fluid dilutions, Reagent dilution techniques, calculating the dilution of a solution, body fluid reagent etc.,

Saturated and supersaturated solutions.

Standard solutions. Technique for preparation of standard solutions eg: Glucose, urea, etc.,

Significance of volumetric flask in preparaing standard solutions.

Volumetric flasks of different sizes,

Preparation of standard solutions of deliquesent compounds (CaCl2,potassium carbonate, sodium hydroxide etc.,)

Preparation of standards using conventional and Sl units

Acids, bases, salts and indicators.

Acids and Bases: Definition, physical and chemical properties with examples. Arrehenius

concept of acids and bases, Lowery – Bronsted theory of acids and bases classification of

acids and bases. Different between bases and alkali, acidity and basicity, monoprotonic

and polyprotonic acids and bases

Concepts of acid base reaction, hydrogen ion concentration, Ionisation of water, buffer,

pH value of a solution, preparation of buffer solutions using pH meter.

Salts: Definition, classification, water of crystallization – definition and different types,

deliquescent and hygroscopic salts

Acid- base indicators: (Theory and Practicals)

Theory – Definition, concept, mechanism of dissociation of an idicator, colour change of

an indicator in acidic and basic conditions, use if standard buffer solution and indicators

for pH determinations, preparatin and its application, list of commonly used indicators

and their pH range, suitable pH indicators used in different titrations, universal indicators

Carbohydrates:

Chemistry of carbohydrates, classification, physical and chemical properties and the biologic importance of carbohydrates.

Proteins:

Biologic importance of proteins , hydrolytic products of protein , classification of amino acids, classification of proteins and lipoproteins

Lipids :

Definition of oils and fats , fatty acids, classification of lipid , properties and biological functions; biological importance of phospholipids and steroids.

Nucleoproteins:

Nucleic acids, nucleotides, nucleosides and structure of nucleic acids, biologically important nucleotides.

Enzymes:

Definition and nature of enzymes, classification, sites, factors affecting enzyme reactions, coenzymes.

Energy metabolism and nutrition:

Calorific value, respiratory quotient, BMR, specific dynamic action, energy requirements, dietary carbohydrates, fiber, nutritional importance of lipids, essential fatty acids, cholesterol, proteins and essential amino acids, nitrogen balance , biological value of protein, protein energy malnutrition.

Chemistry and biological role of vitamins and trace elements.

PRACTICAL

1. Introduction to Laboratory apparatus
Pipettes- different types (Graduated, volumetric, Pasteur, Automatic, etc.)
Calibration of glass pipettes
Burettes, Beakers, Petri dishes, depression plates.
Flasks - different types (Volumetric, round bottmed, Erlemeyer conical, etc.,)
Funnels – different types (Conical, Buchner etc.)
Bottles – Reagent bottles – graduated and common Wash bottles – different type
Specimen bottles, etc.
2. Measuring cylinders, Porcelain dish
Tubes – Test tubes, centrifuge tubes, test tube draining rack, etc.
Tripod stand, Wire gauze, Bunsen burner, sprit lamp, etc.
Cuvettes, significance of cuvettes in colorimeter, cuvettes for visible and UV range, cuvette holders Racks – Bottle, Test tube, Pipette
Dessicator, Stop watch, rimers, scissors
Dispensers – reagent and sample
Any other apparatus which is important and may have been missed should also be covered
Maintenance of lab glassware and apparatus:
Glass and plastic wares in Laboratory
*use of glass: significance of boro-silicate glass ; care and cleaning of glassware, different cleaning solutions for glasswares
* care and cleaning of plasticwares, different cleaning solutions

Weighing different types of chemicals, liquids, hygroscopic compounds, etc.
4. Safety of measurements
5. Preparation of solutions of different molar and normal concentration.

6. Elucidation of basic principles (pH and Buffering system)
7. Preparation of Buffer solutions and checking of pH

8. Demonstration of pH meter
9. Acidimetry and alkalimetry
10.Preparation of standard succinic acid solution
11. Determination of the strength of NaOH solution
12. Determination of the strength of HCl solution
13. Determination of the strength of NH_4OH solution
14. Colorimetry
15. Determination of Absorption Maximum
16. Verification of Lambert-Beer's and Preparation of Standard Curve
17. Qualitative tests for Carbohydrates, Proteins & Fats.

REFERENCE BOOKS

Biochemistry
1. Varley – Clinical chemistry
2. TEITZ – Clinical chemistry
3. Chatterjee & Shinde. A textbook of Medical Biochemsitry, Latest Edn.
4. Ramakrishna, S Prasanna, KG, Rajna, R Text book of Medical Biochemistry, Latest Edn Orient longman, Bombay –1980
5. Vasudevan, DM Sreekumari, S Text book ofBiochemistry for Medical students ,Latest Edn.
6. DAS, Debajyothi Biochemistry Latest Edn. Academic, Publishers, Culcutta – 1992

E. histolytica, Plasmodium, Tape worms, Intestinal nematodes

7. Mycology 4 hours
   Morphology, diseases caused and lab diagnosis of following fungi.
   Candida, Cryptococcus, Dermatophytes ,opportunistic fungi.
8. Virology 10 hours
   General properties of viruses, diseases caused, lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.
9. Hospital infection Causative agents, transmission methods, investigation, prevention and control Hospital infection. 4 hours

10. Principles and practice Biomedical waste management 4 hours

Practical 20 hours

Compound Microscope.
Demonstration and sterlization of equipments – Hot Air oven, Autoclave, Bacterial filters.
Demonstration of commonly used culture media, Nutrient broth, Nutrient agar, Blood agar, Chacolate agar, Mac conkey medium, LJ media, Robertson Cooked meat media, Potassium tellurite media with growth, Mac with LF & NLF, NA with staph
Antibiotic susceptibility test
Demonstration of common serological tests – Widal, VRDL, ELISA.
Grams stain
Acid Fast staining
Stool exam for Helminthic ova
Visit to hospital for demonstration of Biomedical waste mangement.
Anaerobic culture methods.

Internal Assessment
Theory - Average of two exams conducted. 20
Practicals: Record & Lab work* 10

Scheme of Examination

Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	8 (To attempt 6)	6 x 5	30
Short Answer (SA)	12 (To Attempt 10)	10 x 3	30
Total Marks			80

REFERENCE BOOKS

Microbiology

1. Anathanarayana & Panikar Medical Microbioloty
2. Roberty Cruckshank – Medical Microbiology – The Practice of Medical Mircrobiology
3. Chatterjee – Parasitology – Interpretation to Clinical medicine.
4. Rippon – Medical Mycology
5. Emmons – Medical mycology
6. Basic laboratory methods in Parasitology, 1st Ed, J P Bros, New Delhi – 199
7. Basic laboratory procedures in clinical bacteriology, 1st Ed, J P Brothers, New Delhi
8. Medical Parasitology – Ajit Damle

Syllabus for First Year B Sc Lab Technology

School of Allied Health Sciences
Sharda University, Greater Noida

PATHOLOGY

Histo Pathology ,Clinical Pathology, Haematology and Blood Banking
Theory – 70 hours
Practical – 20 hours

HistoPathology - Theory

- Introduction to Histo Pathology
- Receiving of Specimen in the laboratory
- Grossing Techniques
- Mounting Techniques – various Mountants
- Maintenance of records and filing of the slides.
- Use & care of Microscope
- Various Fixatives, Mode of action, Preparation and Indication.
- Bio-Medical waste management
- Section Cutting
- Tissue processing for routine paraffin sections
- Decalcification of Tissues.
- Staining of tissues - H& E Staining
- Bio-Medical waste management

Clinical Pathology – Theory

- Introduction to Clinical Pathology
- Collection, Transport, Preservation, and Processing of various clinical specimens
- Urine Examination – Collection and Preservation of urine. Physical, chemical, Microscopic Examination
- Examination of body fluids.
- Examination of cerebro spinal fluid (CSF)
- Sputum Examination.
- Examination of feces

Haematology – Theory

- Introduction to Haematology
- Normal constituents of Blood, their structure and function.
- Collection of Blood samples
- Various Anticoagulants used in Haematology
- Various instruments and glassware used in Haematology, Preparation and use of glassware
- Laboratory safety guidelines
- SI units and conventional units in Hospital Laboratory
- Hb,PCV
- ESR
- Normal Haemostasis

Bleeding Time, Clotting Time, Prothrombin Time, Activated Partial Thromboplastin Time.

Blood Bank
Introduction
Blood grouping and Rh Types
Cross matching

PRACTICALS

- Urine Examination.
- Physical
- Chemical
- Microscopic
- Blood Grouping Rh typing.
- Hb Estimation,Packed Cell Volume[PCV], Erythrocyte Sedimentation rate{ESR]
- Bleeding Time, Clotting Time.
- Histopathlogy – Section cutting and H &E Staining.[For BSc MLT only]

Internal Assessment

Theory - Average of two exams conducted. 20
Practicals: Record & Lab work* 10

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	8 (To attempt 6)	6 x 5	30
Short Answer (SA)	12 (To Attempt 10)	10 x 3	30
Total Marks			80

REFERENCE BOOKS

Pathology –

1. Culling Histopathology techniques
2. Bancroft Histopathology techniques
3. Koss – cytology
4. Winifred greg – Diagnostic cytopathology
5. Orell – Cyto Pathology
6. Todd & Sanford Clinical Diagnosis by laboratory method
7. Dacie & Lewis – Practical Haematology
8. Ramanic Sood, Laboratory Technology (Methods and interpretation) 4th Ed.
   J.P. Bros, New Delhi –1996)

9. Satish Gupta Short text book of Medical Laboratory for technician J.P. Bros, New Delhi – 1998
10. Sachdev K.N. Clinical Pathology and Bacteriology 8th Ed, J.P. Bros, New Delhi-1991.
11. Krishna - Text book of Pathology. Orient Longman PVT Ltd.

Syllabus for First Year B Sc Lab Technology

School of Allied Health Sciences
Sharda University, Greater Noida

Microbiology

Objective : - This course introduces the principles of Microbiology with emphasis on applied aspects of Microbiology of infectious diseases particularly in the following areas
Principles & practice of sterilization methods.
Collection and despatch of specimens for routine microbiological investigations.
Interpretation of commonly done bacteriological and serological investigations.
Control of Hospital infections
Biomedical waste management
Immunization schedule

Theory - 70 hours

1. Morphology 4 hours
   Classification of microorgaisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.
2. Growth and nutrition 4 hours
   Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.
3. Sterilisation and Disinfection 4 hours
   Principles and use of equipments of sterlization namely Hot Air oven, Autoclave and serum inspissrator. Pasteurization, Anti septic and disinfectants.
   Antimicrobial sensitivity test
4. Immunology 6 hours
   Immunity Vaccines, Types of Vaccine and immunization schedule
   Principles and interpretation of commonly done serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA. Rapid tests for HIV and HbsAg(Technical details to be avoided)
5. Systematic Bacteriology 20 hours
   Morphology, cultivation, diseases caused ,laboratory diagnosis including specimen collection of the following bacteria(the classification, antigenic structure and pathogenicity are not to be taught)
   Staphylocci, Streptococci, Pneumococci, Gonococci, Menigococci, C diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, Esch coli, Klebsiella, Proteus,vibrio cholerae, Pseudomonas & Spirochetes
6. Parasitology 10 hours
   Morphology, life cycle, laboratory diagnosis of following parasites

2nd Year B.Sc Medical Laboratory Technology

BIOCHEMISTRY -II

SYLLABUS

Theory classes: 100hours
Practical classes: 80 hours

THEORY

1. Blood chemistry (Its constituents)

2. Urine chemistry (Its constituents)

3. Biomolecules:

a. Carbohydrate: Metabolism & disorder of carbohydrate

b. Lipids: Metabolism & disorders lipids.

4. Biological oxidation & Free radicals

5. Vitamins: sources, functions, deficiency, requirements,

6. Enzymes – Introduction, Activation energy, classification, activity,

specificity,

kinetics v max, Km, Michaelis Menten equation

7. Mineral metabolism

8. Photometry, spectrometry, flame photometry and Chromatography

9. MPNB - Urea, Uric Acid, Createnine of these importance

10. Nutrition

11. Muscle contraction

12. Biochemistry of Connective tissue

13. Special investigations/ Case studies

Demonstration - Serum electrophoresis

Immunoglobulins

Drug estimation

PRACTICALS

1. Qualitative analysis of carbohydrates, proteins, amino acids.

2. Estimation of blood sugar and Blood Urea

3. Quantitative test for urine glucose and glncose tolerance test (GTT)

4. Quantitative estimation of Total Protein

5. Qualitative screening test for normal and abnormal urine sample.

6. Estimation of non-protein nitrogenous compounds of blood: Blood urea, Creatinine,

Creatinine clearance test (CCT)

6. Protein precipitation and separation of proteins, electrophoresis of serum, CSF and urine proteins.

7. CSF analysis

Scheme of Theory Examination

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry II shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	10 (To attempt 8)	8 x 5	40
Short Answer (SA)	12 (To Attempt 10)	10 x 2	20
Total Marks			80

No Scheme of Practical Examination is given

2nd Year B. Sc Medical Laboratory Technology

MICROBIOLOGY -II

Topics: Parasitology, Mycology and Virology

1. Introduction of Mycology. Terms & Classification.
2. Lab Diagnosis of Fungal Infections 2 Hrs.
3. Mycology 14 Hrs.
- **a. Superficial Mycoses**
  - **Malsezzia furfur, T.nigra, T.pidera**
- **b. Subcutaneous Mycoses**
  - **i. Mycetoma**
  - **ii. Rhinosporidium**
  - **iii.Sporotrichosis**
- **c. Dermatophytes**
- **d. Systemic Mycoses**
  - **i. Histoplasmosis**
  - **ii. Blastomycosis**
  - **iii. Coccidiodosis**
  - **iv. Paracoccidiodosis**
- **e. Opportunistic Fungi**
  - **1. Aspergillosis**
  - **2. Penicillosis**
  - **3. Zygomycosis**
  - **4. Pneumocystis**
  - **5. Mycotoxins**

4. Parasitology
- **1. Protozology-**
  - **Entamoeba histolytica**
  - **Balantidium coli**
  - **Giardia**
  - **Toxoplasma**
  - **Malaria**
  - **Leishmania**
- **2. Helminthology**
  - **Cestodes - Taenia, Echinococcus, D.latum, H.nana**
  - **Trematodes - Schistosoma, Fasciola**
  - **Nematodes – Ascaris, hookworm, Strongyloides, Trichuris, Trichinella, Dracunculus, Filarial worms**

5. Virology- General properties of virus, cultivation of viruses, Pox viruses, Herpes viruses, Adenoviruses, Picornaviruses,Orthomyxovirus, Paramyxoviruses,Arboviruses, Rhabdoviruses, Hepatitis viruses, Oncogenic viruses, HIV, Parvovirus, Viral haemorrhagic fevers, SARS, Rotavirus, Norwalk virus, Astrovirus, Corona virus

PRACTICALS for II year:

Parasitology:

1. Stool examination
- **a. Saline mount**
- **b. Iodine mount**

Mycology:

1. Slide culture technique
2. KOH mount
3. Identification of fungal cultures
- **a. Colony characteristics and Microscopic examination of Candida, Cryptococcus, Trichophyton, Microsporum, Aspergillus niger, Asp fumigatus, Rhizopus, Fusarium, Penicillium.**

Virology

2. Demonstration of embryonated egg inoculation
3. Virology exercise:
- **a. Spots test, ELISA (HBv, HCV, HIV), HI, Paul Bunnel test**

b. Applied exercise – Rabies, Infantile Diarrhoea, Herpus, HBV, HIV, Influenza.

Scheme of Theory Examination

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology II shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	10 (To attempt 8)	8 x 5	40
Short Answer (SA)	12 (To Attempt 10)	10 x 2	20
Total Marks			80

Scheme of Practical Examination

The schem of examination for Microbiology II Practical shall be as follows:

Types of Questions	Marks
Spotters	10
Mycology	15
Virology Test	15
Virology Applied Exercise	15
Stool Examination	15
Record	10
Total Marks	80

Syllabus for 2nd Year B. Sc Medical Laboratory Technology

PATHOLOGY -II

Theory:-

Histopathology and Hematology

Histopathology

Instrumentation : (a) Automated Tissue Processor
(b) Microtomes, Knives, Knife sharpners and Ultramicrotome
(c) Freezing microtome and Cryostat
(d) Automatic slide stainer

Techniques : (a) Routine paraffin section cutting
(b) Frozen section and Cryostat section studies
Staining techniques: Special stains for Carbohydrates, Connective tissue, Nervous tissue, Bone tissue, Collage fibers, Elastic Fibers, Lipids, Organisms, fungi, parasites, pigments and deposits in tissues

Mounting techniques: Various mounts and mounting techniques
.
Electron Microscope, Scanning electron microscope, Dark ground and Flurescent microscope

Museum technology

Microphotography and its applications

Maintenance of records and filing of slides

ICDS Classification and coding

Application of computers in Pathology

Hematology

Hemopoiesis, Stem cells, formed elements and their functions

Anticoagulants used in various hematological studies

Routine hematological tests and normal values:
- **(a) Determination of Hemoglobin and Hematocrit**
- **(b) Enumeration of RBC, WBC & Platelets**
- **(c) Absolute Eosinophil count**
- **(d) Reticulocyte count**
- **(e) Calculation of Red cell Indices**
- **(f) Preperation of staining of blood film for morphology of red cells and differential count**

Special Hematological tests:

(a) Sickling tests
(b) Osmotic fragility test
(c) Determination HbF and HbA2
(d) Hemoglobin Electrophoresis
(e) Investigation of G6PD deficiency
(f) Plasma haptoglobin and demonstration of hemosiderin in urine
(g) Tests for Autoimmune hemolytic anemia
(h) Measurement of abnormal Hb pigments

Hemostasis and Coagulation

(a) Normal hemostasis, mechanism of blood coagulation and normal fibrinolytic system
(b) Collection of blood and anticoagulants used in coagulation studies
(c) Investigation of hemostatic mechanism-BT, CT, whole blood coagulation time test, PT, PTT
(d) Assay of clotting factors
(e) Tests for fibrinolytic activity- Euglobulin , clot lysis test and FDP
(f) Platelet function tests

Investigation of Megaloblastic anemia and Iron deficiency anemia

(a) B12 and Folate assay and Schilling test
(b) Estimation of serum iron and iron binding capacity

Bone marrow biopsy study

(a) Needle aspiration and surgical biopsy technique
(b) Preperation of smears and staining

Demonstration of LE cells

Cytochemistry

Administration in Hematology and Quality control

Practicals:

1. **Paraffin section cutting**
2. **Staining by Hematoxylin & Eosin and other special stains**
3. **Determination of Hemaglobin and Hematocrit**
4. **Red blood cell count**
5. **Total white blood cell count**
6. **Platelet count**
7. **Differential count of white blood cells**
8. **Absolute Eosinophil count**
9. **Reticulocyte count**
10. **Calculation of red cell indices**
11. **Determination of ESR**
12. **Determmination of BT, CT, Whole blood clotting time**
13. **Determination of PT and PTT**
14. **Blood smear preparation and staining**
15. **Osmotic fragility test**
16. **Sickling test**

17. LE cell preparation

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology II shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	10 (To attempt 8)	8 x 5	40
Short Answer (SA)	12 (To Attempt 10)	10 x 2	20
Total Marks			80

No Scheme of Practical Examination is given

Subsidiary Subjects:

1. HUMAN HEALTH & ENVIRONMENTAL SCIENCE

Teaching Hours : 10

Introduction to Human Health and Environment Science
Sources, health hazards and control of environmental pollution Water

The concept of safe and wholesome water. The requirements of sanitary sources of water.

Understanding the methods of purification of water on small scale and large scale. Various biological standards, including WHO guidelines for third world countries. Concept and methods for assessing quality of water.

Domestic refuse, sullage, human excreta and sewage their effects on environment and health, methods and issues related to their disposal.

Awareness of standards of housing and the effect of poor housing on health.

Role of arthropods in the causation of diseases, mode of transmission of arthropods borne diseases, methods of control

Recommended Books.

1.Text Book of Environmental Studies for under gradute courses By Erach Bharucha Reprinted in 2006, Orient Longman Private Limited /Universities Press India Pvt. Ltd.

2. HEALTH CARE IN COMMUNITY AND HOSPITAL SETTING

Teaching Hours : 10

Introduction to Health

Definition of Health, Determinants of Health, Health Indicators of India, Health Team Concept.
National Health Policy
National Health Programmes (Briefly Objectives and scope)
Population of India and Family welfare programme in India

Introduction to Nursing

What is Nursing ? Nursing principles. Inter-Personnel relationships. Bandaging : Basic turns; Bandaging extremities; Triangular Bandages and their application.

Nursing Position, Bed making, prone, lateral, dorsal, dorsal re-cumbent, Fowler's positions, comfort measures, Aids and rest and sleep.

Lifting And Transporting Patients: Lifting patients up in the bed. Transferring from bed to wheel chair. Transferring from bed to stretcher.

Bed Side Management: Giving and taking Bed pan, Urinal : Observation of stools, urine. Observation of sputum, Understand use and care of catheters, enema giving.

Methods Of Giving Nourishment: Feeding, Tube feeding, drips, transfusion

Care Of Rubber Goods

Recording of body temperature, respiration and pulse,

Simple aseptic technique, sterlization and disinfection.

Surgical Dressing: Observation of dressing procedures

First Aid :
Syllabus as for Certificate Course of Red Cross Society of St. John's Ambulance Brigade.

3rd Year B. Sc Medical Laboratory Technology

BIOCHEMISTRY -III

SYLLABUS FOR BMLT III YEAR
Theory classes: 100 hours
Practical classes: 80 hours

THEORY

1. Liver Function tests. Role of the Liver in metabolism, formation of bilirubin and mode of excretion.
2. Gastric Analysis: Composition of gastric juice, concepts of free and bound acids, gastric acid secretions stimulations.
3. Renal function, Renal function test and renal clearance test.
4. Detoxification
5. Acid – Base balance and its disturbances.
6. Minerals & Inorganic ions: Calcium metabolism, phosphate metabolism, sodium-potassium balance and trace element (Fe, CU).
7. Metabolism of proteins and amino acids.
8. Molecular Biology: DNA & RNA, Genetic code, DNA replication, translation, transcription, post translational modification, and genetic engineering.
9. Metabolic disorders:

a. Amino acids
b. Proteins
c. Inborn errors of metabolic disorders.

11. Clinical enzymology.
12. Immunology
13. Immunoassay: Different methods, principle and applications.
14. Quality control (Accuracy, precision, specificity, sensitivity, persantage error, limits of error allowable in laboratory).
15. Biostatistics: Arithmatic mean, median, mode, Correlation Coefficient, Standard deviation, Chi- square test, t-test, ANOVA, multiple ANOVA

PRACTICALS:

Comment: To be provided

1. Specimen Collections: Urine, Blood, Gastric juice,

2. Accuracy, precision and quality control

3. Enzymes: amylase (salivary and Pancreatic), Alkaline Phosphatase, Acid Phosphatase, SGOT, SGPT, LDH and CPK- demonstration on auto analyzer.

4. Liver function tests: estimation of Bilirubin – total and conjugates, Urobilinogen

5. Gastric analysis: Determination of free and total acid, gastric stimulation.

6. Lipid determination of serum lipids – cholesterol, triglycerides and lipoprotein fractionation.

7. Inorganic ions – Determination of calcium in serum and urine, serum phosphates, chloride sodium and potassium.

8. Analysis of caclculi

9. Urine analysis

10. RFT

11. Cardiac markers

Scheme of Examination Theory

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Biochemistry III shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	10 (To attempt 8)	8 x 5	40
Short Answer (SA)	12 (To Attempt 10)	10 x 2	20
Total Marks			80

No Scheme of Practical Examination is given

3rd year B.Sc Medical Laboratory Technology

MICROBIOLOGY- III

SYSTEMIC BACTERIOLOGY, IMMUNOLOGY, APPLIED BACTERIOLOGY

IMMUNOLOGY

1. **Infection 2hrs**
2. **Immunity 4 Hrs.**
   - **A. Innate immunity**
   - **B. Acquired immunity (adaptive immunity)**
   - **C. Active and passive immunity**
     1. **Natural acquired active immunity**
     2. **Artificial acquired active immunity**
     3. **Natural acquired passive immunity - Breast feeding**
     4. **Artificial acquired passive immunity**

03. Immune System

- **A. 1. Cell development**
  - **2. B lymphocytes(general knowledge of their role)**
    - **a. Bursa of Fabricius**
    - **b. Stem cell differentiation**
    - **c. Gut-associated lymphoid tissue (GALT)**
  - **3. T lymphocytes**
    - **a. Stem cell differentiation (general knowledge of their role)**
    - **b. Cytotoxic T (T_C) cells**
    - **c. Delayed-type hypersensitivity T (T_D) cells**
    - **d. Helper T (T_H) cells**
    - **e. Suppressor T (T_S) cells**
  - **5. Natural killer cells**

- **B. Dual nature of the immune system**
  - **i. Humoral immunity**
  - **ii. Cell-mediated immunity**
- **C. General properties of immune responses**
  1. **Recognition of self versus nonself**
     - **a. Clonal selection theory B-cells**
     - **b. Tolerance**
     - **c. Clonal deletion**
  2. **Specificity**
     - **a. Definition**
     - **b. Cross-reactions**
  3. **Heterogeneity**
  4. **Memory**
     - **a. Memory cells**
     - **b. Anamnestic response**

4. **Humoral Immunity**

   General characteristics
   1. **Antigen types**
   2. **Antigen sensitization**
   3. **Plasma cells**
5. **Antigen & Antibody 04 Hrs.**
   1. **Antigens**
   2. **Epitopes (antigenic determinants)**
   3. **Hapten**
   4. **Antibodies consequences of antibody binding**
   5. **Titer**
6. **Immune Response**

   A. Properties of Antibodies (immunoglobulins)*
   1. **Light chains ***

2. **Heavy chains***
3. **Constant and variable regions***
4. **Antigen binding sites***
5. **Fab and Fc regions ***

B. Classes of immunoglobulins*

1. **IgG***
2. **IgM***
3. **IgA***
   a. **J chain**
   b. **Secretory piece**
4. **IgE***
5. **IgD***
6. **Antibody titer**

C. Primary and secondary responses *

1. **Primary response***
2. **Secondary response***

D. Kinds of antigen-antibody responses *

E. How humoral responses eliminate foreign antigens *

1. **Basic mechanisms***
   a. **Agglutination***
   b. **Opsonization***
   c. **Activation of complement* Do not worry about the detailed mechanism of complement. Know that it makes a membrane attack complex and what that is.**
   d. **Neutralization**
2. **Summary of humoral immunity**

7. Monoclonal Antibodies

A. Production

1. **Hybridoma formation ***
2. **Cloning of cells**

B. Uses*

1. **Research tools***
2. **Diagnostic uses***
3. **Therapy***

8. Cell-Mediated Immunity *

A. General characteristics*

B. The cell-mediated immune reactions

1. **Antigen processing**
2. **Helper T (T_H) cells**
   a. **T_H1 (inflammatory T) cells**
   b. **T_H2 cells**
3. **Suppressor T (T_S) cells**
   5. **Cytotoxic (killer) T (T_C) cells**
6. **Natural killer (NK) cells**
7. **Memory T cells**
8. **Lymphokine release C. Superantigens**

9. Factors That Modify Immune Responses

A. Compromised host

B. Modifying factors

1. **Age**
2. **Stress**
3. **Diet**
4. **Exercise**
5. **Injuries**
6. **Environmental factors**

10. Hypersensitivity reactions

11. Autoimmune disorders

12. Transplantation immunology 13.Antimicrobial Sensitivity. Disk diffusion and Dilution 3 Hrs. 14.Bacteriology of Water, Milk and Air 5 Hrs.

15. Systematic Bacteriology 75 Hrs.

Classification, Morphology, Genotypic & Phenotypic characteristics, Pathogenesis, Disease caused, Lab Diagnosis & Prophylaxis

A. Gram Positive Bacteria

i. Staphyloccus
ii. Streptococcus
iii. Pneumococcus
iv. Corynebacteria
v. Clostridia
vi. Bacillus
vii. Listeria
viii Actinomyces
ix. Nocardia

B. Gram Negative Bacteria

i. Neisseria
ii. Enterobacteriaceae
iii. Escherichia
iv. Klebsiella
v. Enterobacter
vi. Proteus
vii. Salmonella
viii. Shigella
ix. Yersinia
x. Pseudomonas
xi. Haemophilus
xii. Brucella
xiii. Pasturella
xiv. Legionella
xv. Bordetella
xvi. Burkholderia
xvii. Gardnerella
xviii. Vibrio
xix. Campylobacter
xx. Helicobacter
xxi. Bacteroides
xxii. Fusobacterium

C. Spirocheates

i. Treponema
ii. Borrelia
iii. Leptospira

D. Mycobacteria

i. M.tuberculosis
ii. M.leprae
iii. Atypical Mycobacteria

E. Mycoplasma
F. Chalmyadiae
G. Ricketssiaceae
H. Applied microbiology- Diseases.
I. Molecular techniques in diagnostic microbiology- PCR, DNA hybridisation

Desirable to know: (There will be no main questions or short notes from this portion. One paper may have only one question under short answers i.e. 3 marks)

a. Erysipelothrix 1.Propionibacteria

2.Rhodococcus 3. Tropheryma 4. Moraxella 5. Serratia
6. Stenotrophomonas
7. Acinetobacter
8. Streptobacillus

9. Parvobacteria

PRACTICALS FOR 3rd YEAR

BACTERIOLOGY

1. Staining-
- **a. Grams staining**
- **b. ZN staining**
- **c. Alberts staining**

2. Hanging drop preparation
3. Culture methods
4. Introduction to biochemical reactions
5. Identification of bacterial culture
- **a. Colony characteristics**
- **b. Morphological characteristics**
- **c. Motility study**
- **d. Interpretation of biochemical reactions**

6. Antibiotic sensitivity testing- Kirby Bauer method
1. Applied bacteriology- exercise
8. Immunology: Serological tests:
- **a. Specimen collection**
- **b. Principle**
- **c. Methods.**
- **d. Procedure**
- **e. Normal values/ Significant titer**
- **f. Interpretations**
- **g. Limitations : of all the following tests**
  - **i Widal**
  - **ii ASO**
  - **iii CRP**
  - **iv RPR/VDRL/TRUST v RA**
  - **vi HBsAg /anti HIV detection**
  - **vii ELISA**

Scheme of Theory Examination

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Microbiology III shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	10 (To attempt 8)	8 x 5	40
Short Answer (SA)	12 (To Attempt	10 x 2	20
	10)		
Total Marks			80

Scheme of Practical Examination

The schem of examination for Microbiology III Practical shall be as follows:

Types of Questions		Marks
Grams Staining		10
ZN Staining		10
Bacteriology Identification	Organism one	10
	Organism two	10
Serology	Test one	10
	Test two	10
Spotters		10
Record		10
Total Marks		80

3rd Year B. Sc Medical Laboratory Technology

PATHOLOGY- III

Cytology, Automation in cytology, Cytogenetics, Cytochemistry Immunohematology and Blood transfusion

Cytology

1. **Normal cell structure, functions, cytologic criteria of malignancy**
2. **Types of specimens, methods of collection & prepertion of cell block**
3. **Different fixatives and methods of fixation**
4. **Staining : (a) Papanicoloau's stain- principle , preparation and staining techniques**

(c) May Grunwald Giemsa stain
(d) Shorr's stain
(e) Aceto orcin stain

Female Genital tract

1. **Anatomy, Histology, Physiology & normal cytology**
2. **Techniques of collection of specimen for cervical cytology study**
3. **Hormonal cytology and cytological indices**
4. **Cervical cytology screening for malignant and nonmalignant conditions , Radiation changes & follow up**
5. **Cytology of Endometrium – normal , nonmalignant and in malignant conditions**
6. **Cytology in Ovarian cancers**

Respiratory tract, Gastrointestinal tract and Urinary tract

1. **Anatomy, Histology and Physiology**
2. **Collection of sample, preparation of smears and staining**
3. **Cytology of normal, nonmalignant & malignant conditions**

C S F and Effusions

1. **Cytology of CSF in inflammatory, nonmalignant & malignant Conditions**
2. **Cytology of effusions in nonmalignant and malignant conditions**

Glands – Breast, Thyroid, Salivary glands and Lymph nodes

1. **Anatomy , Histology and Physiology**
2. **Fine needle aspiration cytology of glands and other soft tissue mass**
3. **Cytologic features in nonmalignant and malignant conditions of different glands and nipple discharges**

Automation in Cytology

1. **Flow cytometry**
2. **Image Analysis**
3. **Principles, Equipments, procedures & Evaluation**

Tissue culture and Immunohistochemistry

1. **Equipments for Tissue culture studies**
   - **(a) Laminar air flow equipment**
   - **(b) Carbon dioxide incubator**
   - **(c) Inverted microscope**

2. **Derivation of culture from tissue**
   - **(a) Enzymatic digestion of tissue using collaginase, protease**
   - **(b) Plating in tissue culture media**
   - **(c) Observation of cells in Invertoscope**
   - **(d) Subculturing & derivation of cell lines**

3. **Characterization of cell lines**
   - **(a) Determination of biochemical markers in cells**
   - **(b) Chromosomal & DNA content of cells**
   - **© Immunological properties of cells**
4. **Preservation of Immortalized cell lines**
   - **(a) Storage in Glycerol in Liquid Nitrogen**
   - **(b) Storage in Dimethyl sulfoxide in Liquid Nitrogen**

Cytogenetics

1. **Introduction to cytogenetics, terminology , classification and nomenclature of human chromosomes**
2. **Methods of karyotypic analysis**
   - **(a) Culture of bone marrow cells, peripheral blood lymphocytes, solid tumors & skin fibroblasts**
   - **(d) Direct preparation from tumor materials**

3. **Characterization of human chromosomes by various banding techniques**
4. **Sex chromatin identification**
5. **Chromosomes in neoplasia and oncogenes**

Immunocytochemistry

1. **Basics concepts, monoclonal antibodies & preparation**
2. **Flurescence reactions**

Immunohematology and Blood transfusion

1. **ABO Blood group and Rh system**
2. **Subgroups of A and B , Other blood groups and Bombay group**
3. **HLA antigens and their significance**

4. **Principles of Blood transfusion:**

   (a) Blood donor selection
   (b) Methods of bleeding donors
   (c) Blood containers, anticoagulants and storage of blood
   (d) Coomb's test and its significance
   (e) Screening of blood for infective material
   (f) Blood components, preparation & component therapy
   (g) Autologous transfusion
   (h) Transfusion reactions and work up
   (i) Blood bank organization, standards, procedures, techniques and quality control

Practicals

1. **Preparation of various cytology smears and fixation**
2. **Papanicoloau's and May Grunwald Geimsa staining**
3. **Hormonal cytology study**
4. **Blood grouping and Rh typing**
5. **Cross matching techniques**
6. **Screening of Donor's blood for infective agents**
7. **Transfusion reaction work up**
8. **Preperation of blood components**

Scheme of Theory Examination

There shall be one theory paper of three hours duration carrying 80 marks. Distribution of type of questions and marks for Pathology III shall be as given under.

Type of Questions	No. of Questions	Marks	Sub-total
Long Essay (LE)	2	2 x 10	20
Short Essay (SE)	10 (To attempt 8)	8 x 5	40
Short Answer (SA)	12 (To Attempt 10)	10 x 2	20
Total Marks			80

No Scheme of Practical Examination is given

Subsidiary Subjects: -

1. **RESEARCH METHODOLOGY, BIOETHICS & BIOSTATISTICS**

Time Allotted: 15 Hours

Course Description:

Introduction to basic statistical concepts: methods of statistical analysis; and interpretation of data

Behavioural Objectives: Understands statistical terms.
Possesses knowledge and skill in the use of basic statistical and research methodology.

Unit – I : Introduction
Meaning, definition, characteristics of statistics.

Importance of the study of statistics.
Branches of statistics.
Statistics and health science including nursing.
Parameters and estimates.
Descriptive and inferential statistics.
Variables and their types.
Measurement scales

Unit – II : Tabulation of Data Raw data, the array, frequency distribution. Basic principles of graphical representation.

Types of diagrams - histograms, frequency polygons, smooth frequency polygon, commulative frequency curve, ogive.
Normal probability curve.

Unit - III : Measure of Central Tendency Need for measures of central tendency
Definition and calculaton of mean - ungrouped and grouped

Meaning, interpretation and calculation of median ungrouped and grouped. Meaning and calculation of mode.
Comparison of the mean, and mode.
Guidelines for the use of various measures of central tendency.

Unit - IV : Measure of Variability
Need for measure of dispression.
The range, the average deviation.
The variance and standard deviation.

Calculation of variance and standard deviation ungrouped and grouped. Properties and uses of variance and SO

Unit -V : Probability and Standard Distributions.
Meaning of probability of standard distribution.
The Binominal distribution.
The normal distribution.
Divergence from normality - skewness, kurtosis.

Unit - VI : Samling Techniques
Need for sampling - Criteria for good samples.
Application of sampling in Community.
Procedures of sampling and sampling designs errors.
Sampling variation and tests of significance.

Unit - VII : Health Indicator
Importance of health Indicator.
Indicators of population, morbidity, mortality, health services.
Calculation of rates and rations of health.

Recommended Books.

B.K. Mahajan & M. Gupta (1995) Text Book of Preventive & Social Medicine, 2002, 17th Edition Jaypee Brothers.

2. COMPUTER APPLICATION & DATABASE MANAGEMENTS

Teaching Hours: 15

The course enables the students to understand the fundamentals of computer and its applications.

Introduction to Data processing :

Features of computers, Advantages of using computers. Getting data into / out of computers. Role of computers. What is Data processing? Application areas of computers involved in Data processing. Common activities in processing. Types of Data processing, Characteristics of information. What are Hardware and Software?

Hardware Concepts :

Architecture of computers, Classification of computers, Concept of damage. Types of storage devices. Characteristics of disks, tapes, Terminals, Printers, Network. Applications of networking concept of PC System care, Floppy care, Data care.

Concept of Software.

Classification of software : System software. Application of software. Operating system. Computer system. Computer virus. Precautions against viruses. Dealing with viruses. Computers in medical electronics

Basic Anatomy of Computers Principles of programming

Computer application - principles in scientific research ; work processing, medicine, libraries, museum , education, information system.

Data processing

Computers in physical therapy - principles in EMG, Exercise testing equipment, Laser.

Scheme of Examination for *MEDICAL ELECTRONICS including COMPUTER APPLICATIONS*

One Written (Theory) paper: Maximum Marks: –80 marks.
No Practical or Viva voce examination

Annexure-XX of Agenda Item no. 6.19

COURSES IN CLINICAL RESEARCH

1. Master of Science in Clinical Research
   (M. Sc. Clinical Research)

2. Post Graduate Diploma in Clinical Research

Awarding Institution	Sharda University
Name of award	M. Sc. / PG Diploma in Clinical Research
Date specification was written	24 - 07 - 2012

Background:

Clinical Research basically denotes any investigation carried out on normal healthy and/or diseased human beings to generate information which can be used for treatment, diagnosis, prevention and relief of symptoms in a disease.

Clinical Trials, a type of Clinical Research, are organized studies on human beings (healthy volunteers/ patients) to evaluate safety and efficacy of new products including drugs, vaccines, diagnostics, medical devices or therapeutic regimens, before they are launched to the market.

Today the world over, new drugs/ vaccines are being developed at a rapid pace which will need evaluation. India with such potentials like a *large pool of highly trained physicians, nurses and technical personnel, numerous world class medical facilities meeting the global requirements for clinical testing, use of English as the primary business and medical language, good IT infrastructure ensuring speedy transfer of information, large treatment "naïve" population and lower costs* is becoming a hub in the world for conducting multi-national and multi-centric clinical trials. Hence the job avenues have increased many fold.

Scope:

It is estimated that India's clinical research sector would grow to Rupees 5000 crores over the next 2-3 years, a tenfold increase from the present meager business of Rupees 450 crores only. From the projections made for pharmaceutical industries, it is indicated that the present number of clinical research professionals is grossly inadequate and at least 30,000 to 50,000 skilled professionals will be required over the next five years.

As a result of the huge demand, the attrition rate in the industry is as high as 40 per cent. If 50,000 professionals is the requirement by 2011, it will need the services of 20 more institutes to fill in the demand gap for clinical research professionals, by 2011.

Aims of the Program:

These programs provide appropriate knowledge and training for graduate/ post-graduate students in order to develop diverse careers in the field of clinical research viz. Clinical Research Associates (CRA), Clinical Research Coordinators (CRC), Medical Writers, Clinical Data Coordinators, Drug Development Associates, Business Development Managers, Clinical Project Managers, Clinical Research Managers, Regulatory Affairs Managers and Biostatisticians in Contract Research Organizations (CROs), pharmaceutical companies, government agencies or academia.

1. Give students' an in-depth training in both the theoretical and practical aspects of clinical research, regulatory affairs, pharmacovigilance and clinical data management.

2. Provide the students with the requisite knowledge that will enable them to pursue a career in the Clinical Research industry/ Pharmaceutical Organizations.

SHARDA UNIVERSITY
Beyond Boundaries

COURSES IN CLINICAL RESEARCH

M. Sc. Clinical Research

Awarding Institution	Sharda University
Name of award	M. Sc. in Clinical Research
Duration	2 - Years
Date specification was written	24 - 07 – 2012

M.Sc. Clinical Research

1. M.Sc. (Clinical Research) ***2 Years***

M.Sc. (Clinical Research) *2 Years*

Eligibility:

a) Graduates/ Post Graduates in nursing, physiotherapy, occupational medicine, etc.

b) Graduates/ Post Graduates in biological sciences including microbiology, biotechnology and biochemistry.

c) Graduates/ Post Graduates in basic sciences like zoology, botany, chemistry and social sciences with work experience in clinical research or any other qualifications considered equivalent by the selection committee.

d) The candidates should have a minimum of 50% marks in their qualifying examination.

Selection criteria:

The selection is based on merit, screening and personal interview

Course design:

These are full time programs comprising of lectures, tutorials, demonstrations, seminars, computer knowledge, personality development, documentation and practical training/internship.

Course contents:

The multi disciplinary curriculum will comprise of core modules related to a foundation course in basic and paramedical sciences, biostatistics, advanced computer education in clinical research, elementary epidemiology, different types of epidemiological studies, research design, research methodology, ethical review procedure, ethics in clinical research, ethics in special conditions like organ transplants, vaccine trials and genetics studies , drug development, drug safety, drug regulatory affairs, pharmacovigilance, advances in clinical trials, clinical trials in practice, reporting and reviewing clinical trials, trial designs, good clinical practice, drug management, data monitoring and analysis, medical writing, medical marketing.

Date for Commencement of Courses: August/ September (every year)

PROGRAMME STRUCTURE

M.Sc. (Clinical Research) *2 Years*

Second Year

SUBSIDIARY SUBJECTS OFFERED

Anatomy
Physiology
Pathology
Microbiology
General & Systemic Pharmacology
PDP/ Computer education
Hos. Orientation Program
Educational visits

CORE SUBJECTS OFFERED

1. Basic Principles of Clinical Research
2. Operational Aspects of Clinical Research

Second Year

CORE SUBJECTS OFFERED

1. **Research Methodology, Epidemiology and Clinical Research Management**
2. **Applications of Advanced Biostatistics, Pharmacology, Pharmacovigilance and Outsourcing in Clinical Research**

Training/ Internship
Thesis/Project Work

FIRST YEAR

Code	Subject	*Contact hrs (T)*	*Contact hrs (P)*
MCR 001	Anatomy	15 hrs	6 hrs
MCR 002	Physiology	15 hrs	6 hrs
MCR 005	Pathology	15 hrs	6 hrs
MCR 004	Microbiology	10 hrs	6 hrs
MCR 003	General & Systemic Pharmacology	40 hrs	-
	Computer education and Personality Development Program		22 hrs
	Educational Visits		25 hrs
MCR 101	Basic Principles of Clinical Research	100 hrs	
MCR 102	Operational Aspects of Clinical Research	100 hrs	50 hrs
	TOTAL	**295 hrs**	**121 hrs**

June – Annual Examination

M.Sc. (Clinical Research) *2 Years*

SECOND YEAR

Code	Subject	*Contact hrs (T)*	*Contact hrs (P)*
MCR 201	Research Methodology, Epidemiology and Clinical Research Management	100 hrs	-
MCR 202	Applications of Advanced Biostatistics, Pharmacology, Pharmacovigilance and Outsourcing in Clinical Research	100 hrs	-
	Training/ Internship	-	120 hrs
	Thesis/Project Work		120 hrs
	TOTAL	**200 hrs**	**240 hrs**

June- End of Course Examinations

SHARDA UNIVERSITY
Beyond Boundaries

COURSES IN CLINICAL RESEARCH

Post Graduate Diploma in Clinical Research

Awarding Institution	Sharda University
Name of award	Post Graduate Diploma in Clinical Research
Duration	1 - Year
Date specification was written	24 - 07 - 2012

1. Post Graduate Diploma in Clinical Research (PGDCR) ***1 Year***

PG Diploma in Clinical Research (PGDCR) *1 Year*

Eligibility:

a) Graduates/ Post Graduates in pharmacy, nursing, physiotherapy, occupational medicine, etc.

b) Graduates/ Post Graduates in biological sciences including microbiology, biotechnology and biochemistry.

c) Graduates/ Post Graduates in basic sciences like zoology, botany, chemistry and social sciences with work experience in clinical research or any other qualifications considered equivalent by the selection committee.

d) The candidates should have a minimum of 50% marks in their qualifying examination.

Course design:

The programs will be intensive and full time. The focus of teaching will be on scientific, ethical and operational issues related to clinical trials. The teaching will comprise of lectures tutorials, documentations, demonstrations and training visits to scientific pharmaceutical organizations for hands on trainings.

Course contents:

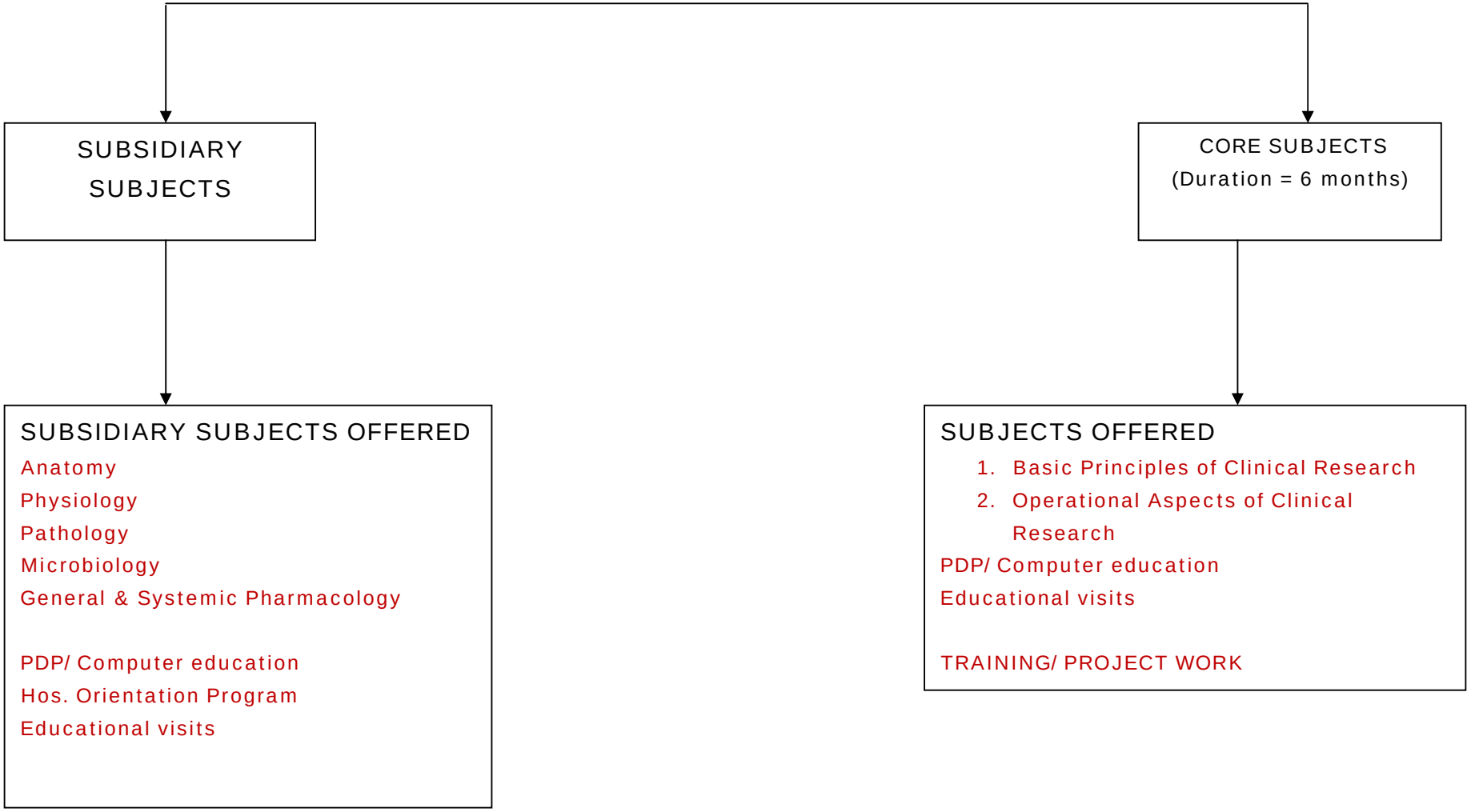
Introduction to basic medical and para clinical sciences relevant to clinical research, elementary biostatistics , introductory pharmacology, drug formulations, drugs used in various clinical conditions , basics of drug development, study design and research methodology, ethics in clinical research, Introduction to pharmaceutical industry , operational issues in clinical trials, pharmacovigilance, drug regulatory affairs, report writing, communication skills, practical documentations, visits to scientific and pharmaceutical industries.

Date for Commencement of Courses:

August/ September (every year)

PROGRAMME STRUCTURE

PG Diploma in Clinical Research (PGDCR) ***1 Year***



PG Diploma in Clinical Research (PGDCR) *1 Year*

Course Curriculum:

Code	Subject	Contact hrs (T)	Contact hrs (P)
MCR 001	Anatomy	15 hrs	6 hrs
MCR 002	Physiology	15 hrs	6 hrs
MCR 005	Pathology	15 hrs	6 hrs
MCR 004	Microbiology	10 hrs	6 hrs
MCR 003	General & Systemic Pharmacology	40 hrs	-
	Computer education and Personality Development Program		22 hrs
	Educational Visits		25 hrs
MCR 101	Basic Principles of Clinical Research	100 hrs	
MCR 102	Operational Aspects of Clinical Research	100 hrs	50 hrs
	TOTAL	**295 hrs**	**121 hrs**

June – Annual Examination

Annexure-XXI of item no. 6.20

CREDIT TRANSFER POLICY

DESCRIPTION OF THE POLICY:

As per the notification no. **SU/Reg./Notification/2011/040** dated **August 4, 2011**, the committee prepared draft Credit Transfer Policy for Sharda university.

This document stipulates Sharda University's policy for granting of credit to prospective students for prior learning that contributes towards satisfying the requirements for an award of the University's Degree. The credit can be awarded based on recognition of studies from a previously completed or partially completed program or qualification with a University in India or abroad, or recognition of certificate courses / bridge programs as required course work components. The policy applies to all degree programs except those which are regulated by the Statutory Bodies / Councils.

OBJECTIVES OF THE POLICY:

The policy aims at allowing the students to study as a part of the programme from one university to another university in India and abroad. Credit for prior learning will be granted only within the constraints of this policy and where program structures and requirements permit acceptance of course work components.

The aim of the credit transfer policy is to:

- provide students with credit towards completing their program based on prior learning, where it can be demonstrated that the prior learning and outcomes achieved, satisfy the objectives of Sharda University's programs course and credit structure;
- assist students who have been awarded credit for prior learning to progress through their award program in less than the normal length of the program;
- facilitate the movement of students between institutions and between programs of various types and levels;
- establish the institutional framework, policies and procedures for the development of credit transfer and articulation agreements between the University and other educational institutions;
- outline the parameters for determining the award of credit, including the maximum level of credit that can be awarded within programs;

DEFINITIONS:

CREDIT:

Credit is the award for prior learning as contributing towards satisfying the requirements for an award of degree/diploma from the University, thereby exempting the student from studying one or more courses while enrolled in the program. Credit can be awarded based on recognition of studies from a previously completed or partially completed program or qualification, and recognition of prior learning by the Committee based on

the relevance of the courses for the program and courses where the student may have backlogs but have achieved minimum grade for promotion to the next year of studies.

Recognition of prior learning (RPL) is the granting of credit for a student's prior informal and non-formal learning, and includes demonstrable expertise, relevant work experience and professional development activities and informal learning acquired through life experience. The student should undergo evaluation process as prescribed by the University.

Articulation agreement is an agreement between Sharda University and another institution to document and publicise a specifically approved pathway for progression between a program at the other institution and a Sharda award program, involving specific credit arrangements.

ADMISSIONS:

Admission to the University is based on academic merit and approved criteria as provided by the Admissions Policy. An applicant who is eligible for the award of credit is not guaranteed an offer of a place, except where this is included as part of the agreement between the University and the other institutional partner. The award of credit to any particular applicant will be subject to the admission of the applicant to the relevant University's award programs.

GRANTING OF CREDITS:

The University may:

- Grant credit for formal study undertaken in recognised institutions at the level of diploma, as per national policy and for international student on case to case basis.
- Grant credit for programs of professional bodies in India and abroad where appropriate certificate is available and acceptable to the University.
- Recognise prior learning in a University in India or abroad of specified subjects in one or more semesters without leading to any degree on certain terms and conditions.

Credit awarded for prior formal learning is assessed by determining the extent to which the applicant's prior studies and assessed standards are equivalent to the content and learning outcomes of one or more courses in the award program. The educational judgement concerning equivalence is based on the content, standards and assessment in the program or course the applicant has undertaken.

Credit awarded based on recognition of prior learning is assessed by determining the extent to which the applicant has achieved the learning outcomes of one or more courses in the award program through the applicant's informal and professional learning. The student should undergo evaluation process as prescribed by the University.

Vice Chancellor may constitute a committee to assess the syllabi evaluation pattern establishing credit equivalence and other related issues. The committee may consist of:-

1. Nominee of Vice Chancellor - Chairman
2. Dean(s) of the concerned School(s) - Member
3. HOD(s) of the concerned Department(s) - Member
4. Two experts to be nominated by the Vice Chancellor - Member

TRANSFER OF GRADES WITH AWARD OF CREDIT

Normally when credit is granted for prior study, the grades achieved in the prior study are not included in the academic transcript and are not included in the calculation of grade point average. Courses for which credit is granted are recorded in the academic transcript with a grade of "**T**" (Transfer) only.

In cases where the Vice Chancellor/committee considers that the grade achieved in the prior study is comparable to the grade which would have been awarded if the course had been studied at the University, approval may be given for the grade achieved in the prior study to be included in the student's academic transcript and thereby in the calculation of the program grade point average.

The credit granted for prior study or grade point in India or abroad, will however not be counted towards University awards i.e. Gold Medal, Silver Medal or Bronze Medal, etc.

CREDIT LIMITS:

The number of credits that may be granted, depends on the level of the prior study and the level of the award program. A student can avail maximum of 50% of the credit points in a programme

ARTICULATION AGREEMENTS

"Articulation" refers to a relatively common progression from one qualification to another at the same or a different level, and usually at different institutions. An articulation agreement is an agreement between Sharda and another institution to document and publicise a specifically approved pathway for progression between a program at the other institution and a Sharda award program, involving specific credit arrangements. Articulation agreements typically involve (but are not limited to) an agreement to award block credit or advanced standing. The amount of credit granted under an articulation agreement is subject to the credit limits prescribed in this policy.

Articulation agreements within the provisions of this policy are approved by the Vice Chancellor on the advice of the concerned Dean/Director Admissions/Committee

TIME LIMIT ON CREDIT

Credit will not normally be granted for studies (or other demonstrated learning achievement) that have been completed more than the time defined for award of degrees in Sharda University's ordinances.

WITHDRAWAL OF CREDIT

The University reserves the right to withdraw credit where an error has been made in assessing an application or where the documentation provided by the applicant is incomplete, misleading or invalid. The withdrawal of credit must be approved by the Vice Chancellor on the recommendation of the concerned Dean/ Director Admissions/Committee

APPROVAL OF CREDIT

Vice Chancellor may approve the recommendations of the committee for transfer of credits.

OTHER PROVISIONS

Notwithstanding, anything stated above, nothing shall be done contrary to the written policy of UGC.

Vice-Chancellor has the discretion to consider special cases.

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B. Tech.

in

Civil Engineering

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Civil Engineering

School of Engineering and Technology

SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Civil Engineering	
School:	School of Engineering and Technology	
Name of the Course:	B.Tech. in Civil Engineering	
Duration:	Four years	
Total number of Credits:	66	
Date of Meeting of BOS:	July 12, 2012	
Members of BOS:	1. Prof. R. L. Misri, Civil	Chairman
	2. Prof. NirendraDev, DTU	Ext Member
	3. Prof. Ranvir Singh, DSW, Sharda	Int Member
	4. Prof. Satyaprakash, HOD, Civil	Int Member
	5. Prof. A.M. Chandra, Civil	Int Member
	6. Prof. D. Goldar, Civil	Int Member
	7. Dr. GauravSaini, Civil	Int Member
	8. Mr. GauravGoel, Civil	Int Member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

LIST OF DEPARTMENTAL ELECTIVES

1. Environmental Engineering-II
2. Public Health Engineering
3. Transportation Engineering-II
4. Transport System and Planning-II
5. Railway Engineering
6. Bridge Engineering
7. Advanced Structural Analysis
8. Earthquake resistant design of buildings
9. Design of Prestressed concrete
10. Design of high rise building

LIST OF OPEN ELECTIVES

1. Quantity Surveying
2. Urban Planning and Development
3. Design of Hydraulic Structures
4. Irrigation Engineering

COURSE STRUCTURE

B.Tech. in Civil Engineering

SEMESTER	Courses (L-T-P) Credits								Lecture Courses	Contact Hr/Week				Credits
										L	T	P	Total	
Summer Industrial Training (0-0-16) 8									**1**	**0**	**0**	**16**	**16**	**8**
VII	Advanced RCC (3-1-0) 4	Fluvial Hydraulics (3-1-2) 5	Dept. Elective-I (3-1-0) 4	Dept. Elective-II (3-1-0) 4	PSE (2-0-4) 4	Open Elective- I (3-1-0) 4	Design Lab (0-0-2) 1	Seminar (0-0-8) 4	**6**	**17**	**5**	**16**	**38**	**30**
Survey Camp (0-0-8) 4									**1**	**0**	**0**	**8**	**8**	**4**
VIII	Project (0-0-16) 8	Sales and Distribution (4-0-0) 4	Dept. Elective-III (3-1-0) 4	Open Elective- II (3-1-0) 4	Dept. Elective-IV (3-1-0) 4				**4**	**12**	**4**	**16**	**32**	**24**

L-lecture, T-tutorial, P-practical

Total Credits: 66

B.Tech.

in

CIVIL ENGINEERING

SYLLABI

CVL 401: Advanced R.C.C.

L-T-P:3-1-0 **Credits: 4**

UNIT 1 **(8)**

Types of stairs according to geometry and structural behavior planning a staircase – effective span of stairs – effective breadth of flight slab- distribution of loads on flights – design of cantilever steps – design of doglegged and open well stairs spanning parallel to the flight.

UNIT 2 **(9)**

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method).

UNIT 3 **(8)**

Analysis and design of beam curved in plan, Structural behavior of footings, design of footing for a wall and a single column,combined rectangular and trapezoidal footings, Design of Raft foundation, Strip and strap footing. Design of Grid floor.

UNIT 4 **(9)**

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall, Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.Introduction to composite structure.

UNIT 5 **(6)**

Design criteria, material specifications and permissible stresses for tanks, design concept of circular and rectangular tanks situated on the ground, design of overhead tanks.

Books:

1. Latest IS : 456 codes.
2. Latest IS: 875 “Code of Practice for Design Loads” (Parts I, II & III).
3. Latest IS: 800 “Use of Structural Steel in GeneralBuilding Constructions”, BIS.
4. Latest IRC 6 “Standard Specifications and Code of Practice for road Bridges”, IRC.
5. Reinforced Concrete – Limit State Design by A. K. Jain, Nem Chand & Bros., Roorkee.
6. Limit State Design of Reinforced Concrete – P. C. Varghese, Prentice Hall India.
7.“Reinforced Concrete Vol.II” by Mallick& Gupta, Oxford & IBH.

Books:

1. Plain and Reinforced Concrete Vol. I & II by O. P. Jain & Jai Krishna, Nem Chand & Bros. 2007 18th reprint .
2.Reinforced Concrete Structures by R. Park and Pauley,1975, Newyork.
3. Reinforced Concrete Design by P. Dayaratnam IBM publications, Newdelhi,1989.

CVL 402: Fluvial Hydraulics

L-T-P:3-1-0 **Credits: 4**

Unit 1: **(15)**

Origin, Properties of sediments, size, shape, fall velocity and its effects, orientation, grain size distribution, Difference between rigid and alluvial channels, Incipient motion of sediment particles, Different approaches to study sediment motion, lift force approach, tractive force approach, theoretical and sub theoretical analysis of Shield, White and others. Types of bed forms or regimes of flow.

Unit 2: **(12)**

Regimes of flow, complexities of regimes in Natural streams, Resistance of flow and velocity distribution in alluvial streams, Bed load transport and saltation, bed load equations, board on dimensional considerations, suspended load transport - mechanism, general equation of diffusion, Total load transport, microspcopic and macroscopic method, suspended load sampling.

Unit 3: **(8)**

Bed level variation in alluvial streams, stream bed changes during floods, degradation, aggradation, silting of reservoirs, variation in plan form of streams, River training for flood control

Unit 4: **(5)**

Critical tractive force method for design of stable channels, comparison of the design with traditional methods

Text Books:

1. Graf, W.H., Hydraulics of Sediment Transport, McGraw Hill International, 3rd printing, 1998.
2. R.J. Garde and K.G. Rangaraju, Mechanics of sediment transportation and alluvial stream problems, Wiley Eastern Ltd,Halsted press,Newyork,1977.

References:

3. A.J.Raudkivi, Loose boundary hydraulics, Pergamon Press,3rd edition

CVL 005: Environmental Engineering-II

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Wastewater Engineering **(6)**

Wastewater characteristics: composition and microbiology of wastewater, BODkinetics.

Unit 2: Wastewater Treatment Design **(8)**

Wastewater treatment: Basic design consideration, principles of reactor designand process flow sheets. Primary sludge Treatment- Grit removal, sedimentation.

Unit 3: Health Engineering **(12)**

Theory and design of biological treatment processes and Sections. Design of aerobicSuspended growth systems including activated sludge process and aerated lagoon.

Unit 4: Water Treatment **(6)**

Theory and design of aerobic attached growth systems including trickling filterand rotating biological contactor.

Unit 5: Sewage Treament **(8)**

Theory and design of waste stabilization ponds and oxidation ditches.Design considerations of anaerobic treatment systems, basics of anaerobic digestors,Sewage treatment plant layout, concept of sustainable wastewater treatment.

Text Books:

1.Peavy, Rowe and Techobanoglous: Environmental Engineering, TMH
2.Metcalf and Eddy Inc.: Wastewater Engineering, TMH
3.Steel and McGhee: Water Supply and Sewerage, PHI
4.Hammer and hammer Jt.: Water and Wastewater Technology, PHI

References:

1.Manual on Sewerage and Sewage Treatment, C.P. H.E. E. O., Ministry ofUrban Development, Government of India, New Delhi

CVL 006: Public Health Engineering

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Introduction **(2)**

Natural and man made hydrological cycles as applied to P.H.E, Duties of Public Health Engineer.

Unit 2: Systems of Sanitation & Sewerage **(3)**

Collection of garbage, Waste water and domestic sewage, Conservancy and water carried system, Different system of sewerage, Disposal of garbage

Unit 3: Sewer Laying **(7)**

Functions and types of sewer, Sewer laying, Ventilation of sewer, Waster water collection system - Different patterns of collection system and use, Sewer appurtenances manhole on straight and junction of two sewers, Drop M.H. manhole, Cleanout, Street inlet with kerb, Channel and kerb-cum-channel inlet, catch pit, Oil grease trap, Grit chamber, Combined grit and grease chamber, Flushing tank, Leaping and overflow sewer, Siphon spillway, Ventilation shaft, Sketches, Functions and locations.

Unit 4: Quantity of Sewage **(3)**

Sources, Factors affecting quantity, Variation of sewage flow, Functional types of sewers

Unit 5: Characteristics of Sewage **(3)**

Characteristics of different types of bacteria, Sewage strength, Significance of different tests.

Unit 6: Sewage Treatment Processes **(14)**

Nature of treatment by three stages, Functions of screen and grit chambers, Rectangular and circular settling tanks, Activated Sludge process, Trickling filter, Flow diagram of treatment plant, Disposal of liquid effluent dilution and broad irrigation, ridge and burrow, aerated Lagoon

Unit 7: House Water Supply And Sanitation **(5)**

Water supply and sanitary fitting-union, coupling , cocks, valve, flushing, tank, nahani trap W.C-Indian, Anglo-Indian and western type, Gully trap, Fresh air intake, Ventilating cowl, Water seal, Trap, anti siphonage pipe, Systems of plumbing and comparison, Inspection chamber, Intercepting chamber, Pipe special single junction, double junction

Unit 8: Rural Sanitation **(3)**

Principles of rural sanitation, Sources of rural water supply, Disposal of garbage, Sullage and night soil, Design of septic tank for given uses

Text Books:

1.Textbook of water supply and sanitary engg. Bridgie, G.S. and Bridies, J.S., DhanpatRai&sons, Delhi,1996
2.Water pollution Mahida,U.N.
3.Water supply & sewerage by Steel & McGhee
4.Environmental Engineering, Peavy, Howe, Tchobanoglous, Tata McGraw Hills

References:

1.Hu-saon,S.K.,Oxford and IBH publishing Co.,New Delhi.
2.The committee on PHE manual and code of practice, the ministry of health, Govt. of India,PHE manual and code of practice-sectiosI,II,III and IV.

CVL 007: Transportation Engineering-II

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Introduction **(10)**

Development and organization of Indian Railways. Modern trends in railways: MAGLEV, TUBE, METRO. Permanent way : Sub-grade, formation, embankment and cutting, track drainage. Rails : Rail gauges, types of rails, defects in rails, rail failure, creep of rail, Coning of Wheels, Tilting of Rails, Rail Joints, Creep of Rails. Rail Fastenings : Fish plates, spikes, chairs, keys, bearing plates. Sleepers : Timber, steel, cast iron, concrete and prestressed concrete sleepers, manufacturing of concrete sleepers, sleeper density, Adzing of Sleepers,. Ballast : Ballast materials, size of ballast, screening of ballast, specification of ballast, tests on ballast.

Unit 2:RailwayGeomtric **(9)**

Gradients, horizontal curves, super-elevation, safe speed on curves, cant deficiency, negative super elevation, compensation for curvature on gradients, track resistance and tractive power. Points & Crossings : Elements of a simple turn-out, details of switch, details of crossings, number & angle of crossings, design of turn-out.

Unit 3: Stations and Yards **(9)**

Site selection for a railway station, layout of different types of stations, classification of stations, types of railway yard, functions of Marshalling yards. Signalling &Interlocking : Classification of signals, method of train working, absolute block system, mechanical interlocking of a two line railway station.

Unit 4: Airport Engineering **(7)**

General, Advantages / disadvantages of air transport, Structure & organization of air transport, Airport planning and site selection and classification of airports. Wind direction, duration and intensity; use of Wind Rose diagram. Obstructions, zoning laws, approach zones, turning zones. Principle of design of run ways, their configuration and orientation.Design of taxiways.Location and utility of aprons, landing strips, hangars.Typical airport layout.Air port marking, and lighting. Air Traffic Control - Airway and airport traffic control, instrumental landing system and air navigational aids.

Unit 5: Harbours and Docks **(5)**

Harbours, Introduction, classification, natural phenomenon affecing the design of harbour viz. wind, wave, tide and currents.Harbor layout with component parts, breakwaters, wharfs and Quays, Jetties and Piers, Dry Dock and Wet Dock, Slipways, Navigational aids. Warehouse and Transit shed.

Text Books:

1. Aggarwal, M.M. “Railway Engineering”, Prabha and Company, New Delhi, 1997.

2. Saxena, S.C., Airport Planning & Design, CBS Publishers, New Delhi
3. Khanna, Arora& Jain Airport Engineering ,Nemchand& Bros.

CVL 008: Transport Systems and Planning-II

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Introduction to Traffic Engineering **(5)**

Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets. Role of transportation: Social, Political, Environmental, Goals and objectives of transportation planning,

Unit 2: Public Transportation **(7)**

Intermediate Public Transport (IPT), Public Transport, Rapid and mass transport system. Traffic Flow and traffic stream variables.

Unit 3: Estimation **(10)**

Estimation and fore casting, trip classification, trip generation: factors and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

Unit 4: Transportation Planning **(9)**

Land Use Transport Planning, Economic Evaluation methods, net-present-Value methods, Benefit Cost method, Internal rate of return method.

Unit 5: Transport System Management **(9)**

Pedestrian facilities, Bicycle facilities, parking and terminal facilities. Transport system management. Long term and short term planning, use of IT in transportation.

Text Books:

1. Introduction to Transportation Engineering: William W. Hay.
2. Introduction to Transportation Engineering planning – E.K. Mortak.
3. Traffic Engineering, L.R. Kadiyali

References:

Metropolitan transportation planning – J.W. Dickey.

CVL 009: Railway Engineering

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Introduction to Railways **(4)**

History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways.

Unit 2: Gauges **(3)**

Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.

Unit 3: Railway Track **(5)**

Requirements of a Good Track, Track Specifications on Indian Railways, Detailed Cross-Section of Single/Double Track on Indian Railways.

Unit4: Railway Fixtures and Fastenings **(7)**

Rails, Sleepers, Ballasst, Subgrade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.

Unit5: Track Geometrics **(8)**

Alignment, Gradients, Horizontal Curve, Super-elevation, Equilibrium Cant, Cant Deficiency, Transition Curves.

Unit 6: Turnout **(5)**

Functions, Working and Design of Turnout, Various types of Track Junctions and their layouts, Level-crossing.

Unit 7: Yards and Stations **(3)**

Site Selection, Classification & Layout of Stations, Marshalling Yard, Locomotive Yard, Equipment at Railway Stations.

Unit8: Signals and Interlocking **(3)**

Objectives, Classification of Signals, Types of Signals in Stations and Yards, Automatic Signalling, Principal of Interlocking.

Unit 9: Morden Railways **(2)**

High Speed Tracks, Improvement in existing track for high speed, Ballastless Track, MAGLEV Track.

Text Books:

1.Text book of railway engineering R.B.Deshpandey

2.Railway engineering N.K.Vaswani

References:

1**.** Permanent way manual, Indian Railway Board

CVL 010: Bridge Engineering

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Design of Railway Bridges **(7)**

Impact factor, General design consideration, Structural design of highway and railway bridges in masonry, reinforced, pre-stressed concrete and steel.

Unit 2: Superstructures **(13)**

Superstructures: Slab bridge, beam and slab bridge, plate girder and composite bridges, Bearings and expansion joints.

Unit3: Bridge Foundation **(9)**

Bridge foundation: types of foundation, design of well and pile foundation.

Unit 4: Loads **(11)**

Bridge vibration: traffic loading, seismic and wind effect, construction techniques and maintenance.

Text Books:

1.D. J. Victor, “Essentials of Bridge Engineering”, Oxford and IBH, 1980.
2.N. KridhnaRaju, “Design of Bridges”, Oxford and IBH, 1988.
3.L. Fryba, “Dynamics of Railway Bridges”, Thomas Telford, 1996.

References:

4.V. K. Raina, “Concrete bridge Practice: Analysis, Design and Economics”, Tata McGraw Hill, 2002.

OEL 011: Quantity Surveying

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Estimation and Costing **(3)**
General items of work in Building – Standard Units Principles of working out quantities for detailed and abstract estimates – Approximate method of Estimating.

Unit 2: Estimation of Buildings **(8)**
Detailed Estimates of Buildings.

Unit 3: Earthwork Estimation **(6)**
Earthwork for roads and canals.

Unit 4: Rate Analysis **(6)**
Rate Analysis – Working out data for various items of work over head and contigent charges.

Unit 5: Bar Bending **(4)**
Reinforcement bar bending and bar requirement schedules.

Unit 6: Contracts **(8)**
Contracts – Types of contracts – Contract Documents – Conditions of contract

Unit 7: Building Valuation **(2)**
Valuation of buildings.

Unit 8: Specifications **(3)**
Standard specifications for different items of building construction.

Text Books:
1.Estimating and Costing by B.N. Dutta, UBS publishers, 2000.
2.Estimation, Costing and Specifications by M. Chakraborthi; Laxmi publications.

References:
1.Standard Schedule of rates and standard data book by public works department.
2.Latest I.S. 1200 (Parts I to XXV: method of measurement of building and Civil Engineering works – B.I.S.)
3.National Building Code

OEL 012: Urban Planning and Development

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Introduction to Urban Planning **(8)**

Definition.Theories in urban and regional planning. Efficiency measures, Planners skills. Planning processes and continuity of planning process.Visual representation for planning purposes.

Unit 2: Types of Planning **(8)**

Integrated Area planning in India.Distribution and sizes of settlements.Factors Affecting regional planning, regional surveys and preparation of regional plans.

Unit 3: Amenities **(8)**

Factors affecting urban growth, town plans and local surveys.Planning for utilities, services and civil amenities.

Unit 4: Networking **(8)**

Service design and networking, settlement and habitat, Open space land use planning, Integrated rural planning schemes.

Unit 5: Urban Development **(8)**

Control and Planning Organisation, Development Control legislation. Master Plans, Growth of urban complexes.

Text Books:

1. Urban and Regional Planning in India - by K.V. Sundaram.
2.Town and Country Planning by Lewis Kuble.

References:

1.The Urban Pattern - by A.B. Gallion.

CVL 011: Advanced Structural Analysis

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Matrix Analysis of Framed Structures (5)

Matrix-multiplication, inversion, and transposition; Analysis of statically determinate trusses by the method of joints, The displacement method of truss analysis; The displacement method of continuous-beam analysis.

Unit 2: Rigid Frames (5)

Displacement-method analysis of rigid frames without sidesway; Displacement-method analysis of rigid frames with single degree of freedom in sidesway; Displacement-method analysis of rigid frames with multiple degree of freedom in sidesway.

Unit 3: Truss Analysis (14)

The force method of truss analysis, The force method of continuous-beam and rigid-frame analysis; The displacement method of composite-structure analysis; Limit analysis of rigid frames by the displacement method; The displacement method of plane-grid analysis.

Unit4: (14)

Direct element method of truss analysis, Direct element method of rigid frame analysis; Direct element method of plane grid analysis; Direct element method of space rigid frame analysis; Truss analysis by method of parts; Rigid frame analysis by method of parts; Tall building frame analysis by triband elimination method.

Unit 5: (2)

Introduction to elasto-plastic behavior of materials, Theory of failure, Plastic hinge formation of metallic structures.

Text Books:

1. Matrix Analysis of Framed Structures -by Weaver & Gere, CBS
2. Structural Analysis : A Matrix Approach, by Pandit&Gupta, TMH
3. Structural Analysis Vol I by R. Vaidyanathan& P. Perumal, Laxmi (2007)
4. Structural Analysis by R. C Hibbeler,Pearson (2008)

CVL 012: Earthquake Resistant Design of Buildings

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Introduction (10)

Introduction - Origin of Earthquakes, magnitude, intensity, ground motions, sensors, Strong motion Concepts of Earthquake Resistant Design of Reinforced Concrete Buildings – Earthquakeand vibration effects on structure, identification of seismic damages in R.C. buildings,Effect of structural irregularities on the performance of R.C. buildings during earthquakesand seismoresistant building architecture. characteristics.

Unit 2: (6)

S.D.O.F. Systems- Equation of motion, free and forced vibrations, damping, Response spectrum

Unit 3: (6)

M.D.O.F Systems.-Two degree and multi-degree freedom systems

Unit 4: Seismic Analysis and Modelling (9)

Seismic Analysis and Modeling of R.C. Buildings- Codal procedure for determination of design lateral loads, in-fill walls, seismic analysis of R.C. building as per IS: 1893 (Part1)

Unit 5: Earthquake Resistant Design (9)

Earthquake Resistant Design of Buildings- Ductility considerations, E.R.D. of R.C. building, Design of load bearing buildings, Design of shear wall

TextBooks:

1. Earthquake Resistant Design of Structures by P. Agarwal& M. Shrikhande
2. Structural Dynamics – Theory & Computation by Mario Paz
3. Dynamics of Structures Theory and Applications to Earthquake Engineering by Anil K. Chopra

References:

1. Introduction to Structural Dynamics by J.M. Biggs
2. Elements of Earthquake Engineering by Jai Krishna and A.R. Chandrasekharan
3.Fundamental of Earthquake Engineering by N.M. Neumarks and E. Rosenblueth
4.Engineering Vibrations byL.S.Jacobsen & R.S. Ayre
5. Structural Dynamics by R. Roy Craig Jr.
6. Dynamics of Structures by R.W. Clough & J. Penjien

CVL 013: Design of Prestressed Concrete

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Introduction to Prestressed Concrete (4)

Historic development – General principles of prestressing, pretensioning and post tensioning – Advantages and limitations of prestressed concrete – Materials – High strength concrete and high tensile steel their characteristics.

Unit 2: Methods of prestressing (6)

I.S.Code provisions, Methods and Systems of Prestressing; Pre-tensioning and post tensioning methods – Analysis of post tensioning - Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

Unit 3: Losses of prestress (6)

LOSSES OF PRESTRESS: Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortage of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage bending of member and frictional losses.

Unit 4: Elastic Analysis (4)

Analysis of sections for flexure; Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons.

Unit 5: Design for Flexure and Shear (6)

DESIGN OF SECTIONS FOR FLEXURE AND SHEAR: Allowable stress, Design criteria as per I.S.Code – Elastic design of simple rectangular and I-section for flexure, shear, and principal stresses – design for shear in beams – Kern – lines, cable profile.

Unit 6: Analysis Of End Blocks (5)

ANALYSIS OF END BLOCKS: by Guyon’s method and Mugnel method, Anchorage zone stresses – Approximate method of design – Anchorage zone reinforcement – Transfer of prestress pre-tensioned members.

Unit 7: Composite Sections (3)

Composite section: Introduction – Analysis of stress – Differential shrinkage – General designs considerations.

Unit 8: Deflection (6)

DEFLECTIONS OF PRESTRESSED CONCRETE BEAMS: Importance of control of deflections – factors influencing deflections – short term deflections of uncrackedmembers

prediction of long term deflections.

Text Books:

1. Prestressed Concrete by Krishna Raju; - Tata Mc.Graw Hill Publications.
2. Prestressed Concrete by N.Rajasekharan

References:

1. Design of Prestressed concrete structures (Third Edition) by T.Y. Lin & Ned H.Burns, John Wiley & Sons.
2. Codes: BIS code on prestressed concrete, IS 1343.

CVL 014: Design of High Rise Buildings

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Wind and Earthquake effects on Structures **(6)**

Review of Damages to Buildings due to Wind and Earthquake.

Unit 2: Dynamic of Structures **(13)**

SDOF Systems: MDOF Systems: Free and Forced Vibrations; Damping, Response Spectrum. Dynamic properties: Response spectrum analysis.

Unit 3: Wind effect on structures **(12)**

Wind design philosophy; Earthquake Resistant Design Philosophy; ductility, Codal Provisions for Wind and Earthquake Effects.

Unit 4: Ducility **(9)**

Design and Detailing for Ductility.

Text Books:

1.Wind Effects on Structures – Emil Simth and Robert Scanlan
2.Dynamic of Structures (2nd Edition) – Ray W. Clough, Joseph Penzien, McGraw Hill International Editions.
3.Dynamics of Structures – Theory and Applications to Earthquake Engineering. Anil K. Chopra, Prentice-Hall of India (1996).

CVL 013: Design of Hydraulic Structures

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Design of Dams **(10)**
Hydrological, geological and engineering studies of dam and reservoir sites. Design of gravity dams, Design of arch dams, Elements of design of buttress dams and arch dam. Design of earth and rock fill dams.

Unit 2: Spillway Design **(6)**
Types, design of over-flow spillways, chute, side channel and shaft spillways.

Unit 3: Design of **(7)**
Design of energy dissipators.Details of construction of rigid and embankment dams.

Unit 4: Design of Hydraulic Structures **(10)**
Detailed design of weirs and barrages, aqueducts, vertical drop and glacis type falls. Design of silt control devices of canals. Design of pumping stations.Design of river training works. Scale model of hydraulic structures. Application of Numerical Techniques to the Design of Hydraulic Structures.

Unit 5: Design of Culverts and River Training Works **(7)**
Hydraulic Design of culverts, cross drainage works, River Training works, falls.

Text Books:

1.U.S. Deptt. of Interior, 'Design of Small Dams', U.S. Govt. Printing Press, Washington.
2.C.V. Davis, 'Hand Book of Applied Hydraulics', McGraw Hill, New York.
3.Concrete dams by Varshney.
4.Theory and Design of Hydraulic structures by Varshney, Gupta & Gupta
5. Water resources engineering by Satyanarayana Murthy. Challa, New Age International Publishers

OEL 014: Irrigation Engineering

L-T-P: 3-1-0 **Credits: 4**

Unit 1: Introduction **(5)**

Necessity of irrigation, Importance of irrigation, Benefits of irrigation, Ill effects of irrigation, Methods of irrigation

Unit 2: Hydrology **(2)**

Definitions, Hydrological cycles, Rainfall, Runoff, Flood discharge

Unit 3: Irrigation **(4)**

Function of water, Various crops of area, Crop season, Delta, Duty, Crop rotation.

Unit 4: Survey **(4)**

Importance of survey, Various type of survey, Reasonability and feasibility of projects

Unit 5: Storage Works **(8)**

Components of storage works, Various zone of storages, Various types of dams and their suitability, Construction materials and procedures, Foundation treatment.

Unit 6: Diversion Works **(5)**

Components of diversion work, Types of diversion work, Functions and suitability of diversion work, Types of Weirs

Unit 7: Canals **(7)**

Components of canal work, Types of canal, Alignment, Design of canal, Different structures in canal network, Canal lining

Unit 8: Lift Irrigation **(3)**

Importance of lift irrigation, Suitability, Advantages and limitations

Unit 9: **(2)**

Various machine, their functions & suitability, List of equipments and their uses.

Text Books:

1.Irrigation water resources and Water power Engineering. P.N. Modi
2.Irrigation Engg. & Hydraulics structures S.K. Garg
3.Principles of Irrigation Engg. S.K. Verma

Annexure-XXII-A of Agenda Item no. 6.21

B.Tech.

in

Computer Science and Engineering

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Applicable to the students admitted in the academic years 2009 – 2011

Department of Computer Science and Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Computer Science and Engineering
School:	School of Engineering and Technology
Name of the Course:	B.Tech. in Computer Science and Engineering (List of Electives for VIIth and VIIIth semesters)
Duration:	Four years
Date of Meeting of BOS:	June 16, 2012 and July 12, 2012
Status:	Approved by BOS
Members of BOS:	1. Prof. Pervez Ahmed, HOD Chairman (16-06-2012) 2. Prof. Abhishek Swaroop, HOD Chairman(12-07-2012) 3. Prof. Padam Kumar, IIT Roorkee Ext. Member 4. Prof. Om Vikas, Former dir., IIITM (G) Ext. Member 5. Mr. Jitesh Khatri, LGE, Noida Ext. Member 6. Dr. Ravi Rastogi, Assoc. Professor Int. Member 7. Mr. T.P. Singh, Asstt. Professor Int. Member 8. Mr. A.K.Sahoo, Assoc. Professor Int. Member 9. Mr. Sudeep Varshney, Asstt. Professor Int. Member 10. Ms Bhairavee Singh, Asstt. Professor Int. Member
Date of meeting of Faculty Board:	July 18, 2012
Status:	Approved by BOS and Faculty Board

Sharda University
School of Engineering and Technology
Department of Computer Science & Engg.

Course Structure

Level 4/Term VII

Sr. No.	SUBJECT CODE	Title of paper	HOURS				CREDITS
		THEORY	L	T	P	TOTAL	
1.	PCM 401	Professional Skill Enhancement	2	0	4	6	4
2.	INT 303	Introduction to Design & Analysis of Algorithms	4	1	-	5	4
3.	CMP 401	Human Computer Interaction	4	1	-	5	4
4.	CMP 007 CMP 008	**D elective 5** (a) Software Testing & Quality Assurance (b) Fundamentals of Mobile Computing	4	1	-	5	4
5.	CMP 009	**D elective 6** (a) Real Time Systems	4	1	-	5	4
6.	OE	**O elective**	4	1	-	5	4
7.	CMP 452	**Technical Seminar**	-	-	-	-	4
PRACTICALS							
8.	CMP 451	Human Computer Interaction lab	-	-	2	2	1
9.	INT 353	Design & Analysis of Algorithms lab	-	-	2	2	1
		TOTAL	22	5	8	35	**30**

Sharda University

School of Engineering and Technology

Department of Computer Science & Engg.

Course Structure

Level 4/Term VIII

Sr. No.	SUBJECT CODE	Title of paper	HOURS				CREDITS
		THEORY	L	T	P	TOTAL	
1.	HMM 401	Human Resource Management	4	-	-	4	4
2.	CMP 453	Project	-	-	-		12
3.	CMP 010 CMP 011	**D elective 7** (a) Advanced Computer Networks (b) Fundamentals of Software Project Management	4	1	-	5	4
4.	CMP 012 CMP 013	**D elective 8** (a) Computer Simulation and Modeling (b) Wireless Communication	4	1	-	5	4
5.	OE	**O elective**	4	1	-	5	4
		TOTAL	16	3		19	**28**

Total Credits=58

LIST OF DEPARTMENTAL ELECTIVES

1. CMP 009: Real Time Systems.
2. CMP 008: Fundamentals of Mobile Computing
3. CMP 007: Software Testing & Quality Assurance
4. CMP 010: Advanced Computer Networks
5. CMP 011: Fundamentals of Software Project Management
6. CMP 012: Computer Simulation and Modeling
7. CMP 013: Wireless Communication

LIST OF OPEN ELECTIVES

1. OEL 007: Data Mining and Knowledge Discovery
2. OEL 016: Expert Systems

B.Tech.

in

Computer Science and Engineering

(VIIth and VIIIth Semester Electives)

SYLLABI

CMP 401: Human Computer Interaction

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction **(10)**

HCI Introduction, CHI, MMI, Human System Interaction, User Friendliness, Interaction Techniques and Tasks, Basic Interaction Tasks, Composite Interaction Task, Interaction Styles, Speech Recognition, Natural Language Processing, Fields of HCI, The Contents of Human-Computer Interaction, Nature of Human-Computer Interaction, HCI Application Areas, Goals and Aspects of HCI, HCI Groups

UNIT 2: Interfaces **(10)**

Term Interface, Good and Bad Interfaces, Features of a Good Interface, User interface, Quality of User Interface, Types of User Interfaces, Command Line Interface, Advantages of Command Line Interface, Graphical User Interface, Document Interfaces and their types, Single Document Interface (SDI), Multiple Document Interface (MDI), Tabbed Document Interface

UNIT 3: Interface Design **(10)**

WIMP, Different Expansions, GUI vs. WIMP, Interaction Paradigms, Hypertext, Hypermedia, Hyperlink, URL, www, Web-browser, Eight golden rules of user interface design, Principles of user interface design

UNIT 4: Design Models and Ergonomics **(10)**

User interface models, User interface design methodologies, Efficacy of user interface design, Dialogue box design, Development and evaluation of user interface design, user centered design, Factors in user interface design, HCI design models, Process of interface analysis, User documentation, Ergonomics introduction, Human factors, Physical issues in ergonomics, cognitive issues in ergonomics

UNIT 5: Usability **(10)**

Usability introduction & its need, usability acceptability, What to measure in Usability, Usability Engineering, Life cycle, how to achieve high usability, Usability evaluation and testing, Learnability, Flexibility

Text Books:

1. Rajendra Kumar, " Human Computer Interaction" Second Edition, Firewall Media New Delhi

Reference Books:

1. Alan Dix, Janet Finlay, Gregory Abowd, Ruel Beale "Human Computer Interaction", PHI
2. Ben Shneiderman, "Design the User Interface: Strategies for Effective Human-Computer Interaction" Pearson Education

CMP 008: Fundamentals of Mobile Computing

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction **(10)**

Evolution of Wireless communication concepts, Market for mobile Communication, Simplified reference model, Applications in business, networks, mobile and wireless devices and location dependent services. Wireless Transmission: Radio transmission frequencies, Signals, Antennas, Signal Propagation, Multiplexing, Modulation, Spread Spectrum, Cellular System.

UNIT 2: Medium Access Control **(10)**

Motivation for specialized MAC, SDMA, FDMA, TDMA, CDMA, Comparison of S/F/T/CDMA. **Telecommunication System:** GSM, DECT, Mobile services, System architecture, Protocols, Localization and calling, Security.

UNIT 3: Satellite System Broadcast System **(10)**

Basics and Applications, Cyclical repetition of data, Digital audio/ video broadcasting, Broadcasting convergence and mobile communication.

UNIT 4: Wireless LAN **(10)**

Infrared, Radio transmission, Infra structure and Ad-hoc network, IEEE802.11, Hyper LAN, Bluetooth. **Medium Network Layer:** Mobile IP, Dynamic host configuration protocol, Mobile Ad-hoc Network.

UNIT 5: Mobile Transport Layer **(10)**

Traditional and classical TCP, TCP over 2.5G/3G/4G wireless network. **Mobility:** File System, World Wide Web, Wireless Application Protocol.

Text Books:

1. Jochen Schiller,“Mobile Communications”,Addison-Wesley, second edition, 2004.

Reference Books:

1. Charles Perkins, “Mobile IP”, Addison Wesley.
2. Charles Perkins, “Ad hoc Networks”, Addison Wesley.
3. Upadhyaya, “Mobile Computing”, Springer
4. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002, ISBN 0471419028.

CMP 009: Real Time Systems

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction to Real-Time Systems (10)
Introduction to real time systems, Basic architecture and requirements, Types and features, soft and hard real time systems, periodic and aperiodic tasks, specification of time constraints

UNIT 2: Real Time Task Scheduling (10)
Need, issues and methodologies, Priority based scheduler, value based scheduler and pre-emptive scheduling, multiprocessor environment, Deterministic scheduling, hardware schedulers

UNIT 3: Multitasking in Real-Time Systems (10)
Deadlocks, Synchronization, Inter task communications and task management, Message queue and mailbox

UNIT 4: Handling Resources in Real Time Systems (10)
Effect of resource contention and Resource Access Control (RAC), non preemptive Critical Sections, Basic Priority-Inheritance and Priority-Ceiling protocols, Stack based Priority-Ceiling protocol, Use of Priority-Ceiling protocol in Dynamic Priority system, Preemptive Ceiling protocol, Access control in Multiple unit resources, Controlling current access to Data Objects.

UNIT 5: Real Time Operating Systems (10)
General concepts, Unix and Windows as RTOS, Survey of commercial RTOS, effect of Resource Contention and Resource Access Control (RAC)

Text Books:

1. Liu, Jane W.S., “Real Time Systems”, Pearson Education, 2000.

Reference Books:

1. Laplante, Phillip A., “Real-Time Systems Design and Analysis”, WSE, 3rd Ed., 2004.
2. Li Quing, “Real-Time Concepts for Embedded Systems”, CMP books, paperback 2003

INT 303: Introduction to Design & Analysis of Algorithms

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction **(10)**

Algorithm design paradigms, motivation, concept of algorithmic efficiency, Run time analysis of algorithms, Growth of Functions, Asymptotic Notations, Recurrence relations, Divide and conquer: Structure of divide-and-conquer algorithms: examples-Binary search, Quick sort, Merge sort, Stassen's Multiplication, Medians and Order Statistics; Analysis of divide and conquer.

UNIT 2: Dynamic Programming **(10)**

Overview, Difference between dynamic programming and divide and conquer, Applications and analysis: Assembly Line Scheduling, All-pairs Shortest path in graphs, Matrix Chain Multiplication, Longest Common sequence, 0/1 Knapsack Problem, Optimal Binary Search Tree.

UNIT 3: Greedy Method **(10)**

Overview of the Greedy paradigm, Analysis and examples of exact optimization solution (minimum cost spanning tree), Fractional Knapsack problem, Single source shortest paths, Task Scheduling Problem. Overview and analysis of Backtracking & Branch and Bound algorithms (N-Queens Problem & Sum of Subsets)

UNIT 4: Advanced Data Structure **(10)**

Red-Black Trees, Insertion/Deletion of elements in RB-Tree, B-Trees, Inserting/Deleting in B-Trees, Augmenting data structure, Interval Tree, Binomial and Fibonacci Heaps, Data Structure for Disjoint Sets.

Unit 5: Selected Topics **(10)**

NP Complete and NP Hard Problems, Amortized Analysis, Approximation algorithms, Randomized Algorithms, String Matching.

Text Books:

1. Cormen et al. "Introduction to Computer Algorithms", Prentice Hall India.

Reference Books:

1. Sahni et al., "Fundamentals of Computer Algorithms", Galgotia Publication.
2. Hopcroft A., "The Design and Analysis Computer Algorithms", Addison Wesley

CMP 007: Software Testing & Quality Assurance

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction **(10)**

Software Testing Fundamentals, Faults, Errors, and Failures, Testing Objectives, Principles of Testing, Software Requirement Specifications(SRS), Behavior and Correctness, Testing and Debugging, Software metrics, Software Testing Life Cycle, Testing activities and Levels, White Box and Black Box Testing.

UNIT 2: Unit Testing **(10)**

Concept of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing, Debugging. Overview of Control Flow Testing: Outline of Control Flow Testing, Control Flow Graph, Paths in a Control Flow Graph, Path Selection Criteria, All-Path Coverage Criterion.

UNIT 3: Data Flow & System Integration Testing **(10)**

Data Flow Anomaly, Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms, Data Flow Testing Criteria, Comparison of Data Flow Test Selection Criteria, Feasible Paths and Test Selection Criteria. System Integration Testing: Concept of Integration Testing, Different Types of Interfaces and Interface Errors, System Integration Techniques, Software and Hardware Integration, Test Plan for System Integration.

UNIT 4: Functional Testing **(10)**

Equivalence Class Partitioning, Boundary Value Analysis, Decision Tables, Random Testing, Error Guessing, Category Partition. System Test Design: Test Design Factors, Requirement Identification, Characteristics of Testable Requirements, Test Case Design Effectiveness, Introduction to acceptance testing, Software Test Automation, Introduction to Test Tools.

UNIT 5: Software Reliability & Quality **(10)**

Definitions of Software Reliability, Factors Influencing Software Reliability, Reliability Models, Quality: Definition, Five Views of Software Quality, ISO 9000:2000 Software Quality Standards, Capability Maturity Models.

Text Books:

1. Sagar Naik, Piyu Tripathy, “Software Testing and Quality Assurance: Theory and Practice”, Wiley.

Reference Books:

1. K.K. Aggrawal and Yogesh Singh, “ Software Engineering” New Age International Publication
2. Paul C. Jorgensen, “Software Testing - A Craftsman’s Approach”, CRC Press.
3. William Perry, “Effective methods for Software Testing”, Wiley.
4. Daniel Galin, “Software Quality Assurance”, Pearson Education.

CMP 010: Advanced Computer Networks

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction **(10)**
Characteristics of Peer to Peer, Server based, Broadcast & Point to Point networks. Packet/Circuit/Message switching, Datagram & Virtual Circuit Network. Hubs, bridges, switches, Routers & Gateways.

UNIT 2: Data Link Layer Protocols **(10)**
ARQ based error control, Data Link Protocols: HDLC, SLIP, PPP, 802.11 a/b/g Wireless LAN, 802.15 and 802.16.

UNIT 3: Internetworking **(10)**
Tunnelling, Fragmentation, IP address & Subnetting, CIDR, DHCP.Internet protocols: IPv4, IPv6: Type of addresses, Header format, Extension headers, Addressing & routing, security issues.

UNIT 4: Wireless Network **(10)**
Wireless WANs: Introduction, Wireless WANs & MANs, Ad-Hoc Wireless MANs, MAC Protocol for Ad-Hoc Wireless MANs, Transport Layer and Security Protocols for Ad Hoc Wireless Networks, Hybrid Wireless Networks, Introduction to Satellite networks.

UNIT 5: Transport Layer Protocols **(10)**
The OSI and TCP/IP transport layer, Duties of Transport layer, Transport layer protocols for Ad-Hoc networks, Routing in Wireless Networks.

Text Book:

1. Forouzen, "Data Communication and Networking", TMH (Fourth edition)

Reference Books:

1. A.S. Tanenbaum, “Computer Networks”, Pearson Education (Fourth edition)
2. W. Stallings, “Data and Computer Communication”, Macmillan Press
3. C. S. R. Murthy and B. S. Manoj, **“**Ad Hoc Wireless Networks: Architectures and Protocols”, Pearson Education

CMP 011: Fundamentals of Software Project Management

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction to Project Management **(10)**
Importance of Software Project Management, stages of Project, Stakeholders of Project, Project Management Framework, Software Tools for Project Management

UNIT 2: Project Planning **(10)**
Integration Management, Project Plan Development, Plan Execution Scope Management, Methods for Selecting Projects, Project Charter, Scope Statement, Work Breakdown Structure Stepwise Project Planning: Overview, Main Steps in Project Planning

UNIT 3: Project Scheduling **(10)**
Time Management: Importance of Project Schedules, Schedules and Activities, Sequencing and Scheduling Activity, Project Network, Network Planning Models, Duration Estimating and Schedule Development, Critical Path Analysis, Program Evaluation and Review Technique (PERT)

UNIT 4: Project Cost Management **(10)**
Importance and Principles of Project Cost Management, Resource Planning, Cost Estimating, Types of Cost Estimation, Expert Judgement, Estimating by Analogy, COCOMO Model, Cost Budgeting, Cost Control

UNIT 5: Project Quality Management **(10)**
Quality of Information Technology Projects, Stages of Software Quality Management, Quality Planning, Quality Assurance, Quality Control, Quality Standards, Tools and Techniques for Quality Control

Text Books:

1. Kathy Schwalbe , “Information Technology Project Management”, International Student Edition, THOMSON Course Technology, 2003
2. Bob Hughes and Mike Cotterell , “Software Project Management”, Third Edition, Tata McGraw-Hill

Reference Books:

1. S.A. Kelkar , “Software Project Management, A Concise Study”, Revised Edition, Prentice-Hall India, 2003

CMP 013: Wireless Communication

L T P: 4-1-0 **Credit: 4**

UNIT 1: Radio Propagation over Wireless Channel (10)
Evolution of mobile radio communication fundamentals, fundamentals of wireless communication, bandwidth concept, type of signals, quantization, channel coding, equalization, large scale path loss: propagation models, reflection, diffraction and scattering, Small scale multi path propagation, multi path effect/ fading in land mobile system.

UNIT 2: Wideband Modulation Techniques (10)
Spread spectrum modulation techniques: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum (FH-SS), OFDM (Multi carrier Modulation), Introduction to multiple Access: time division multiple access (TDMA), space division multiple access (SDMA), code division multiple access (CDMA) and frequency division multiple access (FDMA).

UNIT 3: Broadcast Networks (10)
Introduction to Broadcast Systems, DAB, Digital Radio Mondiale(DRM), HD Radio Technology, Digital Video broadcasting(DVB), Direct to home(DTH)

UNIT 4: Infrastructure-Based/Cellular Networks (10)
Introduction to Mobile Networks, GSM System, GPRS, EDGE, and CDMA based standard, IMT-2000, WLL, Mobile Satellite Communication, 3G and 4G, Cognitive Radio Network (5G).

UNIT 5: Ad Hoc Network, WLAN and WMAN (10)
Introduction, Bluetooth, Wi-Fi Standard, WiMAX Standard, Wireless Sensor Networks, IEEE 802.15.4 and Zigbee, Ultra-wideband(UWB), IEEE 802.20.

Text Book:
1. Upena Dalal, “Wireless Communication”, Oxford Higher Education

Reference Books:

1. Willium C. Y. Lee, “Mobile communication Design and fundamentals”
2. D. R. Kamilo Fehar, “Wireless digital communication”
3. Haykin S & Moher M., “Modern wireless communication”, Pearson, 2005.
4. T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson

CMP 012: Computer Simulation & Modeling

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction to Modelling and Simulation (10)
Nature of Simulation Systems, Models and Simulation, Continuous and Discrete Systems, system modeling, concept of simulation, Components of a simulation study, Principles used in modeling, Static and Dynamic physical models, Static and Dynamic Mathematical models Introduction to Static and Dynamic System simulation, Advantages Disadvantages and pitfalls of Simulation.

UNIT 2: System Simulation and Continuous System Simulation (10)
Types of System Simulation, Monte Carlo Method, Comparison of analytical and Simulation methods, Numerical Computation techniques for Continuous and Discrete Models, Distributed Lag Models, Cobweb Model. Continuous System models, Analog and Hybrid computers, Digital-Analog Simulators, Continuous system Simulation languages, Hybrid simulation, Real Time Simulation

UNIT 3: System Dynamics & Probability Concepts in Simulation (10)
Exponential growth and decay models, logistic curves, Generalization of growth models, System dynamics diagrams, Multi segment models, Representation of Time Delays. Discrete and Continuous probability functions, Continuous Uniformly Distributed Random Numbers. Stochastic processes. Generating Discrete distributions, Non-Uniform Continuously Distributed Random Numbers, Rejection Method.

UNIT 4: Simulation of Queuing Systems and Discrete System Simulation (10)
Poisson arrival patterns, Exponential distribution, Service times, Normal Distribution Queuing Disciplines, Simulation of single and two server queue. Markov chain and Markovian processes, Application of queuing theory in computer system, Discrete Events, Generation of arrival patterns, Simulation of programming tasks.

UNIT 5: Introduction to Simulation Languages and Analysis of Simulation Output: (10)
GPSS: Action times, Succession of events, Choice of paths, Conditional transfers ,program control statements. SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels, SIMSCRIPT statements. Estimation methods, Replication of Runs, Batch Means, Regenerative techniques, Time Series Analysis, Spectral Analysis and Autoregressive Processes.

Text Books:

1. Gorden G., “System Simulation”, Second Edition, PHI
2. Nar Singh Deo, “System Simulation with Digital Computer”, PHI

Reference Books:

1. Seila, “Simulation Modeling”, Cengage Learning
2. Law .,”Simulation Modeling And Analysis”, McGraw Hill
3. Harrington, “Simulation Modeling methods”, McGraw Hill
4. Severance, " System Modeling & Simulation”, Willey Pub
5. Garcia, A, “Probability and Random Processes for Electrical Engineering”, Adison Wesley

OEL 007: Data Mining & Knowledge Discovery

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction to Data Mining **(10)**

Defining Data Mining, Related technologies - Machine Learning, DBMS, OLAP, Statistics, Data Mining Goals, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Applications.

UNIT 2: Data Mining Knowledge Representation **(10)**

Task relevant data, Background knowledge, Interestingness measures, Representing input data and output knowledge, Visualization techniques.

UNIT 3: Data Mining Algorithms **(10)**

Association rules, Motivation and terminology, Example: mining weather data, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis, Classification, Basic learning/mining tasks, Inferring rudimentary rules: 1R algorithm, Decision trees, covering rules, Prediction.

UNIT 4: Mining Real Data **(10)**

Preprocessing data from a real medical domain, Applying various data mining techniques to create a comprehensive and accurate model of the data, Advanced techniques

UNIT 5: Data Mining Software and Applications **(10)**

Text mining: extracting attributes (keywords), structural approaches (parsing, soft parsing), Bayesian approach to classifying text, Web mining: classifying web pages, extracting knowledge from the web , Data Mining software and applications

Text Books:

1. Han, Kamber, “Data Mining Concepts and Techniques”, Morgan Kaufmann.
2. Ian H. Witten and Eibe Frank, “Data Mining: Practical Machine Learning Tools and Techniques”, Morgan Kaufmann.

Reference Books:

1. M.H. Dunham, “Data Mining Introductory and Advanced Topics”, Pearson Education.
2. Michael Berry and Gordon Linoff, “*Data Mining Techniques for Marketing, Sales, and Customer Relationship Management*”, John Wiley.

OEL 016: Expert Systems

L T P: **4-1-0** **Credit:4**

UNIT 1: Introduction. **(10)**

Expert System (ES) Concepts, Definition, Features, Architecture and organization, Characteristics of ES, History of ES and Development, Introduction to Classical ES (DENDRAL, HEARSAY, XCON (R1) MYCINE,GATES and QMR), Introduction Expert System Tools (Expert System Shell), Importance and Future of Expert Systems.

UNIT 2:. Knowledge Representation and Acquisition **(10)**

Consideration, Component and Models (Production Rules, OVA, Semantic Networks, Frames, Logic and Neural Networks) of Knowledge representation in ES, Knowledge Acquisition and Domain Expert, Knowledge Acquisition *via* Rule Induction, Rule Generation, Rule Induction Tools.

UNIT 3: Inference Engine **(10)**

The Knowledgebase and its Role in ES development, Architecture of Inference Engine, The Role of Inference Engine, Inference using Forward & Backward Chaining Algorithms, Mixed Mode of Chaining, Rule-based Expert System Shells, ES Environment. Uncertainty Management (Bayesian Probability, Dempster-shafer theory of combining evidence, Fuzzy Logic, Confidence & Certainty Factors).

UNIT 4: Validation. **(10)**

ES Justification, Rule-base validation (Consistency and completeness checks, Validation of Chaining Rules, Impact of Confidence Factor), Performance Verification (Data Collection and Verification and Performance Measures)

UNIT 5: Implementation and Deployment **(10)**

ES development project management, ES Architecture (Rule-based or Hybrid) Type and ES Development Tools Selection, Software & Hardware Consideration, Deployment, Monitoring & Maintenance, Staffing & Training, Documentation.

Text book(s)

1. James P. Ignizio, “Introduction to Expert Systems: The Development & Implementation of Rule-based Expert Systems”, McGraw-Hill.
2. Donald A. Waterman, *A Guide to Expert Systems*, Pearson Education.

Reference book (s)

1. Jackson Peter, ”Introduction to Expert Systems”, Addison Wesley.
2. W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Prentice Hall.
3. Elain Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill.
4. Giarratano, Joseph C. and Riley, Gary, “Expert Systems, Principles and Programming”, Thomson Learning Inc.

B.Tech.

in

Electrical and Electronics Engineering
VII and VIII Sem

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Electrical and Electronics Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Electrical and Electronics Engineering
School:	School of Engineering and Technology
Name of the Course:	B. Tech. in Electrical and Electronics Engineering (VII and VIII Sem)
Duration:	one year
Total number of Credits:	54
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. S.K. Bhattacharya, HOD — Chairman 2. Prof. H. O. Gupta, Director, JIIT, Noida — Ext. Member 3. Prof. Surekha Bhanot, BITS, Pilani — Ext. Member 4. Prof. H.K. Verma, Dist. Professor — Int. Member 5. Prof. J.D. Sharma, Dist. Professor — Int. Member 6. Mr. S.P. Jaiswal, Asstt. Professor — Int. Member 7. Mr. Vadhtya Jagan, Asstt. Professor — Int. Member 8. Mr. C. Mohan, Asstt. Professor — Int. Member 9. Ms. Soma Deb, Asstt. Professor — Spl. Invitee
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by BOS and Faculty Board

COURSE STRUCTURE

SEMESTER	Courses (L-T-P)C L=Lecture, T=Tutorial, P=Practical, C=Credits							Lecture Courses	Contact Hr/Week				Credits
									L	T	P	Total	
VII	Power System –II (4-1-2) 5	Switchgear & Protection (4-1-0) 4	Elective- 5 (4-1-2) 5	Elective-6 (4-1-0) 4	Open Elective (4-1-0) 4	Seminar 4	Humanities and Management/ communications skills (4-1-0)4	**6**	**24**	**6**	**4**	**34**	**30**
VIII	Elective -7 (4-1-0) 4	Elective-8 (4-1-0) 4	Open Elective (4-1-0)4	Project (0-0-10)8	Humanities and management/ Communications Skills (4-1-0) 4			**4**	**16**	**4**	**10**	**30**	**24**

LIST OF DEPARTMENTAL ELECTIVES

Elective-5

1. Expert Systems
2. Electrical Drives and their Control
3. Design of Electrical Apparatus
4. Application of Power Electronics to Power System

Elective-6

1. CMOS VLSI Design
2. Power Quality
4. Antenna and Radar Engineering
5. Digital Signal Processing

Open Elective

1. Renewable Energy System
2. Instrumentation and Process Control

Elective-7

1. Satellite Communication
4. Optical Communication
5. Telemetry and SCADA

Elective-8

1. Power System Dynamics
2. Bio-Medical Instrumentation
3. Power System Deregulation

Open Elective

1. Energy Managements and Energy Efficient Technology

EEE 401: Power System- II

L T P: 4-1-2 **Credit: 5**

UNIT 1: Introduction **4**

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor.

UNIT 2: Real Power - Frequency Control **10**

Fundamentals of speed governing mechanism and modelling: Speed-load characteristics – Load sharing between two synchronous machines in parallel; concept of control area, LFC control of a single-area system: Static and dynamic analysis of uncontrolled and controlled cases, Economic Dispatch Control. Multi-area systems: Two-area system modelling; static analysis, uncontrolled case; tie line with frequency bias control of two-area system derivation, state variable model.

UNIT 3: Reactive Power–Voltage Control **12**

Typical excitation system, modelling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; method of voltage control: Injection of reactive power, Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer and MVAR injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

UNIT 4: Commitment and Economic Dispatch **12**

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost, Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method, (No derivation of loss coefficients). Base point and participation factors, Economic dispatch controller added to LFC control.

UNIT 5: Introduction to Computer Control of Power Systems **2**

Text Books:

1. Olle. I. Elgerd, ‘Electric Energy Systems Theory – An Introduction’, TataMcGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2003.

2. Allen.J.Wood and Bruce F.Wollenberg, ‘Power Generation, Operation and Control’, John Wiley & Sons, Inc., 2003.
3. P. Kundur, ‘Power System Stability & Control’, McGraw Hill Publications, USA,1994.

Contd...

Reference Books:

1. D.P. Kothari and I.J. Nagrath, ‘Modern Power System Analysis’, Third Edition,Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
2. L.L. Grigsby, ‘The Electric Power Engineering, Hand Book’, CRC Press & IEEE Press, 2001.

EEE 402: Switchgear and Protection

L T P: 4-1-2 **Credit: 4**

UNIT 1: Introduction to Power System Protection **7**

Need for protection; nature and causes of faults; types of faults; fault current calculation using symmetrical components; power system earthing; zones of protection; primary and back up protection; essential qualities of protection; typical protection schemes.

UNIT 2: Relay Operating Principles and Constructions **8**

Electromagnetic relays; various relay constructions; principles of over-current, directional, differential and distance relays.

UNIT 3: Protection of Power Apparatus **8**

Protection of transformers, generators, motors, bus bars and transmission lines; CTs and VTs and their applications in protection schemes.

UNIT 4: Modern Relays **2**

Introduction to static and digital/numerical (microprocessor based) relays

UNIT 5: Theory of Circuit Interruption **8**

Physics of arc phenomena and arc interruption; restriking voltage & recovery voltage; rate of rise of recovery voltage; resistance switching; current chopping; interruption of capacitive current.

UNIT 6: Circuit Breakers **7**

Types of circuit breakers; principle of operation and construction of air-break ,air blast, oil, SF6 and vacuum circuit breakers; comparative merits and demerits of different circuit breakers; testing of circuit breakers; familiarization with Indian and International standards on LV and HV circuit breakers.

Text Books:

1. B. Ravindranath, and N. Chander, 'Power System Protection & Switchgear', Wiley Eastern Ltd., 1977.

2. Sunil S. Rao, 'Switchgear and Protection', Khanna publishers, New Delhi, 1986 .

Contd.....

Reference Books:

1. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, ‘A Text Book on Power System Engineering’, Dhanpat Rai & Co., 1998.

2. Y.G. Paithankar and S.R. Bhide, ‘Fundamentals of Power System Protection’, Prentice Hall of India Pvt. Ltd., New Delhi – 110001, 2003.\

3. C.R. Mason,” The Art and science of protective Relaying”, Wiley Eastern, 1982.

4. T.S.M. Rao , “Power System Protection - Static Relays with Microprocessor Applications”, 2nd Edition, Tata McGraw Hill, 2008.

EEE 451: Power System Simulation Lab

L T P: 0-0-2 **Credit: 1**

List of Experiments

1. Load Flow Analysis - I: Load Flow Study using Gauss-Seidel Method

2. Load Flow Analysis - II: Load Flow Study using Newton-Raphson and Fast-Decoupled Methods

3. Transient Analysis: Single-Machine connected to Infinite Bus System

4. Short Circuit Study for i) L-G Unbalanced Fault

   ii) L-L-L Balanced Fault

5. Transient Stability Analysis of Multimachine Power Systems.

6. Generation Scheduling of Thermal Generating Plants.

7. Generation Scheduling of Hydro Power Plants.

8. To study the IDMT over current relay and determine the time-current characteristics.

9. To study percentage differential relay and obtain its characteristics.

10. To study thermal relay and obtain its characteristics.

11. To study over voltage relay and obtain its characteristics.

12. To study under voltage relay and obtain its characteristicss.

EEE 052: Electric Drives Lab

L T P: 0-0-2 **Credit: 1**

List of Experiments

1. Variable Torque Control of Induction Motor.

2. Chopper Control of DC Motor.

3. Chopper Control of separately excited DC motor.

4. Study of different types of a loading on a particular load.

   (a) Intermediate Loading

   (b) Continuous Loading

5. Methods of starting Induction Motor.

6. Variable Voltage Control of Induction Motor.

7. Microcontroller based speed control of single phase induction motor.

8. Microcontroller based single phase bridge configuration cyclo-converter.

9. Speed control of separately excited dc motor by varying armature voltage using single- phase fully controlled bridge converter.

10. To study closed loop control of separately excited dc motor

Simulation Based Experiments (using MATLAB or any other software)

11. To study starting transient response of separately excited dc motor

12. To study speed control of separately excited dc motor using single phase fully / half controlled bridge converter in discontinuous and continuous current modes.

13. To study speed control of separately excited dc motor using chopper control in motoring and braking modes.

14. To study starting transient response of three phase induction motor

15. To study speed control of three phase induction motor using

(a) constant/V/F control (b) Constant Voltage and frequency control.

OEL 016: Expert Systems

L T P: **4-1-0** **Credit: 4**

UNIT 1: Introduction. **(10)**

Expert System (ES) Concepts, Definition, Features, Architecture and organization, Characteristics of ES, History of ES and Development, Introduction to Classical ES (DENDRAL, HEARSAY, XCON (R1) MYCINE,GATES and QMR), Introduction Expert System Tools (Expert System Shell), Importance and Future of Expert Systems.

UNIT 2:. Knowledge Representation and Acquisition **(10)**

Consideration, Component and Models (Production Rules, OVA, Semantic Networks, Frames, Logic and Neural Networks) of Knowledge representation in ES, Knowledge Acquisition and Domain Expert, Knowledge Acquisition *via* Rule Induction, Rule Generation, Rule Induction Tools.

UNIT 3: Inference Engine **(10)**

The Knowledgebase and its Role in ES development, Architecture of Inference Engine, The Role of Inference Engine, Inference using Forward & Backward Chaining Algorithms, Mixed Mode of Chaining, Rule-based Expert System Shells, ES Environment. Uncertainty Management (Bayesian Probability, Dempster-shafer theory of combining evidence, Fuzzy Logic, Confidence & Certainty Factors).

UNIT 4: Validation. **(10)**

ES Justification, Rule-base validation (Consistency and completeness checks, Validation of Chaining Rules, Impact of Confidence Factor), Performance Verification (Data Collection and Verification and Performance Measures)

UNIT 5: Implementation and Deployment **(10)**

ES development project management, ES Architecture (Rule-based or Hybrid) Type and ES Development Tools Selection, Software & Hardware Consideration, Deployment, Monitoring & Maintenance, Staffing & Training, Documentation.

Text book(s)

1. James P. Ignizio, “Introduction to Expert Systems: The Development & Implementation of Rule-based Expert Systems”, McGraw-Hill.
2. Donald A. Waterman, *A Guide to Expert Systems*, Pearson Education.

Reference book (s)

1. Jackson Peter, ”Introduction to Expert Systems”, Addison Wesley.
2. W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Prentice Hall.
3. Elain Rich and Kevin Knight, “Artificial Intelligence”, Tata McGraw Hill.
4. Giarratano, Joseph C. and Riley, Gary, “Expert Systems, Principles and Programming”, Thomson Learning Inc.

EEE 004: Electric Drives and their Control

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction to Electrical Drives **10**

Electrical Drives- advantages of Electrical Drives, Parts of Electrical Drives; Electrical motors, power modulators, sources, control unit. Classification of Drives, Dynamics of motor-load system. Components of load torques, Nature and classification of load torque.

Unit 2: Selection of Motor Rating **8**

Thermal model of motor for heating and cooling, classes of motor duty, motor ratings for different duty cycles.

UNIT 3: Solid state control of DC motor converters **12**

Motor performance parameters, supply performance parameters, single phase semi converter fed separately DC motor, fully controlled converter fed DC drive with continuous and discontinuous current conduction, performance- Numerical analysis and analytical performance, converter fed DC series motor with continuous and discontinuous conduction.

UNIT 4: Dual converter fed DC drive **10**

Non-simultaneous control and simultaneous control mode. Chopper fed DC Drive, Types of chopper, DC series motor drive, closed loop control- current limit control and inner current control loop. Stability analysis.

Text Books:

1. G.K.Dubey, ‘‘ Fundamentals of Electric Drives’’ Prentice Hall,1989
2. P.C Sen, ‘‘Thyristor D.C Drives’’ John wiley & sons, 1981

Reference Books :

1. S.K. Pillai, ‘‘A First Course in Electric Drives’’ New Age International Publishers, 2007
2. Ned Mohan, ‘‘Power Electronics Converters Applications and Design’’ John wiley & sons, 2007.
3. G.K.Dubey, ‘‘Power Semi Conductor Controlled Drives’’ Prentice Hall,1989
4. F.N.D. Murphy and F.G.Turnable, ‘‘Power Electronic Control of an AC Motors’’ Prentice Hall, 1988.
5. S. Sivanagaraju, ‘‘Power Semiconductor Drives’’ PHI, 2009
6. David Finney, ‘‘Variable Frequency AC Motor Drive Systems’’ Peter Peregrinus Ltd, 1988.
7. R.Krishnan, ‘‘Electric Motor Drives Modeling Analysis and Control’’ Prentice Hall, 2

EEE 005: Design of Electrical Apparatus

L T P: 4-1-0 **Credit: 4**

UNIT 1: Magnetic Circuits **6**

Concept of magnetic circuit, MMF calculation for various types of electrical machines – real and apparent flux density of rotating machines.

UNIT 2: Cooling of Electrical Machines **7**

Thermal Rating: continuous, short time and intermittent short time rating of electrical machines, direct and indirect cooling methods – cooling of turbo alternators.

UNIT 3: Transformers **9**

Constructional details of core and shell type transformers, leakage reactance calculation for transformers output rating of single phase and three phase transformers, optimum design of transformers , design of core, yoke and windings for core and shell type transformers, design of tank and cooling systems of transformers. Evolution of performance parameters from the designed details.

UNIT 4: Three Phase Induction Motors **9**

Constructional details of squirrel cage and slip ring motors, output equation, main dimensions, choice of specific loadings , leakage reactance calculation for induction machine, design of stator , design of squirrel cage and slip ring rotor , equivalent circuit parameters from designed data , losses and efficiency calculations.

UNIT 5: Synchronous Machines **9**

Constructional details of cylindrical pole and salient pole alternators, output equation, choice of specific loadings, main dimensions, short circuit ratio, leakage reactance calculation synchronous machine, design of stator and rotor of cylindrical pole and salient pole machines , design of field coil, performance calculation from designed data , introduction to computer aided design.

Text Books:

1. A.K. Sawhney, ‘A Course in Electrical Machine Design’, Dhanpat Rai and Sons, New Delhi, 1984.
2. S.K. Sen, ‘Principles of Electrical Machine Design with Computer Programmes’, Oxford and IBH Publishing Co.Pvt Ltd., New Delhi, 1987.

Contd....

Reference Books:

1. R.K. Agarwal, ‘Principles of Electrical Machine Design’, S.K.Kataria and Sons, Delhi, 2002.

2. V.N. Mittle and A. Mittle, ‘Design of Electrical Machines’, Standard Publications and Distributors, Delhi, 2002.

3. Performance and Design of A.C Machines by M.G Say

EEE 006: Applications of Power Electronics to Power System

L T P: 4-1-0 **Credit: 4**

UNIT 1: **Basic Concepts** **8**

Steady state and dynamic problems in AC systems. Flexible AC transmission systems (FACTS), Principles of series and shunt compensation, Description of static variable Compensator (SVC), thyristor controlled series compensators (TCSC).

UNIT 2 : Power Electronic Devices **8**

Static phase shifters (SPS), static condenser (STATCOM), static synchronous series compensator (SSSC) and unified power flow controller (UPFC).

UNIT 3: Modelling Analysis **8**

Modelling and Analysis of FACTS controllers, Control strategies to improve system stability.

UNIT 4: Power Quality **8**

Power Quality problems in distribution systems, harmonics creating loads, modelling, harmonic prorogation series and parallel resonances, harmonic power flow.

UNIT 5: Mitigation **8**

Mitigation of harmonics, filters, passive filters, active filters, shunt, series, hybrid filters, voltage sags & swells, voltage flicker, mitigation of power quality problems using power electronic conditioner, IEEE standards.

Text Books:

1. G. T. Heydt, Power Quality/ Stars in a circle publications, Indiana, 1991.

2. T. J. E. Miller, Static Reactive Power Compensation, John Wiley & Sons, New York, 1982.

ECE 402: CMOS VLSI Design

LT P: (4-1-0) **Credit: 4**

Unit-1: Introduction

Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality.
MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design.
***MOS Transistor*:** MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances

Unit-2: MOS Inverters

Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter.
MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.

Unit-3: Combinational MOS Logic Circuits

Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates)

Sequential MOS Logic Circuits: Introduction, behavior bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.

Unit-4: Dynamic logic circuits

Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic.

Unit-5: Low – Power CMOS Logic Circuits

Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits.

TEXT/REFERENCE BOOKS:

1. Sung-Mo Kang & Yosuf Leblebici, “CMOS Digital Integrated Circuits: Analysis & Design”, TMH, 3rd Edition.
2. D. A. Pucknell and K. Eshraghian, “Basic VLSI Design: Systems and Circuits”, PHI, 3rd Ed.
3. W. Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

EEE 007: Power Quality

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction to Power Quality **6**

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT 2: Voltage Sags and Interruptions **6**

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT 3: Overvoltages **10**

Sources of over voltages: Capacitor switching, lightning, Ferro resonance, mitigation of voltage swells, Surge arresters, low pass filters, power conditioners, lightning protection, shielding, line arresters, protection of transformers and cables, computer analysis tools for transients, PSCAD and EMTP.

UNIT 4: Harmonics **10**

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT 5: Power Quality Monitoring **8**

Monitoring considerations: Power line disturbance analyzer, per quality measurement equipment, harmonic / spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

Text Books:

1. Roger.C.Dugan, Mark.F.McGranagham, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill, 2003

.

Reference Books:

1. Arrillaga J.,Simith B.C. ,Watson N.R. and Wood A.R. "Power System Harmonics Analysis" John Willey &Sons 1997
2. Wakipen G.J., "Power System Harmonics : Fundamentals ,Analysis and Filter design" Springer,2001
3. Shankran C., "Power Quqlity" CRC Press. 2001

ECE 303: Digital Signal Processing

L T P: 4-1-0 **Credit: 4**

UNIT 1: The Discrete Fourier Transform 10

Basic elements of Digital Signal Processing, Ideal Sampling, reconstruction and concept of Aliasing. Introduction to CTFT and DTFT , Discrete Fourier Transform, Properties of DFT: Periodicity, Linearity, Symmetry Multiplication of two DFT, Circular Convolution, Additional DFT properties: Time reversal ,circular time shift, circular frequency shift, complex conjugate properties, circular correlation, multiplication of two sequences, Parseval's theorem Linear Convolution using the DFT. Use of DFT in Linear Filtering

UNIT 2: Efficient Computation of the DFT: FFT Algorithm 10

Computation of the Discrete Fourier Transform: Computational complexity of the direct computation of the DFT, Efficient computation of Two Real sequences and 2N-Point Real Sequences,Goertzel Algorithm, Decimation-in-Time FFT algorithms, Decimation-in-frequency FFT algorithms.

UNIT 3: Implementation of Discrete-Time Systems 10

Digital Filter Structure: Block Diagram representation, Signal Flow Graph Representation, FIR Digital Filter Structure, Direct-Form Structure, Cascade Form Structures,Frequency Sampling Structures and Lattice Structures. IIR Filter Structures,Direct form Structures,Cascade Form Structures,Parallel form Structures and Lattice Structures .

UNIT 4: Design of Digital Filters 10

Design of FIR Filters: Symmetric and Antisymmetric FIR Filters, Design of Linear phase FIR Filter using Windows and Frequency sampling method, Design of Optimum Equiripple Linear-phase FIR Filters. Introduction to Chebyshev and Butterworth Filter.Gibbs Phenomenon. Design of IIR Filters:Design by Approximation of Derivatives ,by Impulse Invariance and by Bilinear Transformation .

Text Books:

1. G. Proakis and D.G. Manolakis, "Digital Signal Processing, Principals, Algorithms, and Applications", Pearson Education, 4th ed., 2007.

Reference Books:

1. A. Y. Oppenhein and R. W. Schater, "Digital Signal Processing", PHI 1975

2.A. Y. Oppenhein, R. W. Schater and J. R. Buck, "Discrete Time Signal Processing", PHI 1999

OEL 017: Renewable Energy Systems

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction **3**

Energy reserves and estimates, global energy scenario, environmental, social and economic impact of renewable energy use.

UNIT 2: Solar Energy **8**

Solar Energy: Solar energy applications, availability of Solar radiation energy, solar thermal systems, solar photovoltaics - basic PV operation, PV technologies, electrical characteristics, interfacing technology.

UNIT 3: Wind Energy **8**

Wind Energy: Wind resource assessment and modeling, types of wind turbines, performance assessment, control and electrical aspects.

UNIT 4: Water Power **8**

Water Power: hydropower power equation, large and small hydro, hydro turbines, control and electrical aspects.

UNIT 5: Biomass Energy **8**

Biomass Energy: Biomass as a source of energy, biogas–its generation and utilization for thermal and electricity generation

UNIT 6: Other Sources **5**

Other Sources: Geothermal energy, hydrogen energy, fuel cells, wave energy and tidal power.

Text Books:

1 Kemp, William H., "The Renewable Energy Handbook: A guide to rural energy independence, off-grid and sustainable energy", Aztext Press,2003
2 Sorensen, B, "Renewable Energy", Elsevier, 2004

Reference Books:

1 Duffie, John A. & William A. Beckman.," Solar Engineering of Thermal Process", John Wiley, 2006
2 Wereko-Brobby, Charles Yand Haqun, and Essel B. "Biomass and Technology", John Wiley, New York, 1996
3 R. Clare," Tidal Power: Trends and Development", Thomas Telford, London, 1992

OEL 018: Instrumentation and Process Control

L T P: 4-1-0 **Credit: 4**

UNIT 1: Transducers **9**

Definition, advantages of electrical transducers, classification, characteristics, factors affecting the choice of transducers, Potentiometers, strain guages, resistance thermometer, thermistors, Thermocouples, LVDT, RVDT, Capacitive, Piezoelectric Hall effect and opto electronic transducers.

UNIT 2: Industrial Measurements **7**

Measurement of motion, force pressure, temperature, flow and liquid level, vibration ect... fibre optic transducers, microsensors.

UNIT-III: **7**

Telemetry

General telemetry system, land line & radio frequency telemetering system, transmission channels and media, receiver & transmitter, data

Data Acquisition System

Analog data acquisition system, digital data acquisition system, modern digital data acquisition system.

UNIT 4: Display Devices and Recorders **8**

Display devices, storage oscilloscope, spectrum analyzer, strip chart & xy recorders, magnetic tape & digital tape recorders.

UNIT 5: Process Control **9**

Principle, elements of process control system, process characteristics, proportional (P), integral (I), derivative (D), PI, PD and PID control modes. Electronic, pneumatic & digital controllers. smart sensors, smart transmitters.

Text Books:

1. E.O. Decblin, “Measurement System, Application & design”, Mc Graw Hill.

2. B.C. Nakra & K.Chaudhry, “Instrumentation, Measurement and Analysis”, Tata Mc Graw Hill 2nd Edition

Contd.
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3. Curtis Johns, “Process Control Instrumentation Technology”, Prentice Hall

Reference Books:

1.A.K.Sawhney, “Advanced Measurements & Instrumentation”, Dhanpat Rai & Sons

2. W.D. Cooper and A.P. Beltried, “Electronics Instrumentation and Measurement Techniques” Prentice Hall International

3. Rajendra Prasad, “Electronic Measurement and Instrumentation Khanna Publisher

4. M.M.S. Anand, “Electronic Instruments and Instrumentation Technology” PHI International.

MWT 013: Satellite Communications

LT P: (4-1-0) **Credit: 4**

Unit-1: Introduction

Elements of Satellite Communication. Orbital mechanics, look angle and Orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.

Unit-2: Satellite Subsystem

Attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna
Satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.

Unit-3: **Propagation effects and their impact on satellite-earth links**

Attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc. Introduction of various satellite systems: VSAT, low earth orbit and nongeostationary,

Unit-4:

Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS,Signal Levels, Timing accuracy, GPS Receiver Operation

Unit-5: Global Mobile Satellite Systems

Antenna System for mobile satellite applications, Evolution, Antenna Requirement and Technical Characteristics, Classification of Mobile Satellite Antenna (MSA), Low gain
omni directional Antenna, Medium gain Directional Antenna, High gain Directional Aperture Antenna, Wire Quadrifilar Helix Antenna(WQHA) for Hand held Terminals, Antenna Systems for Mobile Satellite Broadcasting.

TEXT/REFERENCE BOOKS:

1. B. Pratt, A. Bostian, “Satellite Communications”, Wiley India.
2. D. Roddy, “Satellite Communications”, TMH, 4th Ed.
3. S. D. Ilcev, “Global Mobile Satellite Communication”, Springer
4. R. Pandya, “Mobile and Personal Communication Systems and Services”, PHI.

ECE 401:Optical Communication

LT P: (4-1-0) **Credit: 4**

Unit-1: Overview of optical fiber communication
The general system, advantages of optical fiber communications. Optical fiber wave guides-Introduction, Ray theory transmission. Optical fiber Modes and configuration, Mode theory for circular Waveguides, Step Index fibers, Graded Index fibers.
Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index.

Unit-2: Signal distortion in optical fibers
Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Attenuation Measurements Techniques, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening. Overall fiber dispersion in Multi mode and Single mode fibers, Non linear effects.

Unit-3: Optical Sources
LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product.
Laser Diodes- Basic concepts, Classifications, Semiconductor injection Laser, Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, resonant frequencies, reliability of LED & ILD

Unit-4: Source to fiber power launching

Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors.

Unit-5: Link Design
Point to Point Links, Power Penalities, Error control, Multichannel Transmission Techniques, WDM concepts and component overview, OTDR and optical Power meter

TEXT/REFERENCE BOOKS:

1. John M. Senior, “Optical Fiber Communications”, PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, “Optical Fiber Communications”, TMH, 4th Edition, 2008.
3. Joseph C. Plais, “Fiber Optic Communication”, Pearson Education, 4th Ed, 2004

EIE 010:Telemetry and SCADA

L T P: 4-1-0 **Credit: 4**

UNIT 1: Introduction **3**

Meaning and purpose of telemetry, remote control and SCADA; Message versus signal; Signal formation, conversion and transmission.

UNIT 2: Analog Communication Techniques **6**

Analog modulation of AC carrier; Amplitude modulation and frequency spectrum of AM wave; Frequency modulation and frequency spectrum of FM wave; Phase modulation and frequency spectrum of PM wave; FM versus PM; Analog modulation of pulse carrier, basics of PAM, PFM, PWM and PPM.

UNIT 3: Digital Communication Techniques **5**

Digital modulation of pulse carrier, basics of PCM and DPCM; Digital modulation of AC carrier, ASK, FSK and ASK; Error detection and correction methods, error control techniques.

UNIT 4: Signal Transmission Media and Multiplexing **8**

Copper wires and cables; Basics of radio communication, terrestrial radio and satellite radio; Basics of optical fibres and optical fibre communication; Basics of TDM, FDM and WDM

UNIT 5: Telemetry **8**

Basic telemetry scheme and its components; Telemetry error and its sources; Direct voltage and direct current telemetry systems; AM and FM telemetry systems; Multi-channel PAM and PWM telemetry systems; Single and multi-channel digital telemetry systems; Short-range radio telemetry and satellite telemetry.

UNIT 6: SCADA **10**

Supervisory control versus distributed control; Layout and parts of SCADA system, detailed block schematic of SCADA system; Functions of SCADA system: data acquisition, monitoring, control, data collection and storage, data processing and calculation, report generation; MTU: functions, single and dual computer configurations of MTU; RTU: functions, architecture / layout; MTU-RTU communication and RTU-field device communication,

Reference Books:

1. D. Patranabis, Telemetry Principles,Tata-McGraw Hill, 2001.
2. Stuart A. Boyer, Supervisory Control and Data Acuisition(SCADA),4th Edition, International Society of Automation, 2010.
3. Torsen Cegrell, Power System Control Technology,Prentice Hall,1986.
4. Wayne Tomasi, Electronic Communication Systems, Pearson Education, 2008.
5. William Scheber, Electronic Communication Systems, Prentice Hall, 2005Contd....
6. William Stallings, Data and Computer Communications, 8th Edition, Pearson-Prentice Hall, 2007.

EEE 008: Power System Dynamics

L T P: 4-1-0 **Credit: 4**

UNIT 1: Modelling of Synchronous Machines **10**

Synchronous Machines: Modelling of synchronous machine, flux linkage equations, voltage equations and equivalent circuit, real and reactive power control, Transient and sub transient effects, reactance and time constants of synchronous machines, characteristics under steady state and transient conditions.

UNIT 2: Steady State and Dynamic Stabilities **10**

Development of swing equation, linearization of swing equation. Steady state stability of single machine connected to an infinite bus and two machine systems. Coherent and non-coherent machines, dynamic stability of power system. Introduction to classical
model of multi machine system.

UNIT 3: Multi machine Transient Stability **8**

Numerical methods for solution of differential equations, Transient stability studies using modified Euler method and Runge – kutta fourth order method

UNIT 4: Stability and Control **12**

Factors affecting steady state and transient stabilities, methods of improving steady state, dynamic and transient stabilities, series capacitor compensation of lines, excitation control, power stabilizing signals, High speed circuit breaker, auto – reclosing circuit breaker, single pole and selective pole operation, by pass valuing and Dynamic braking.

Text Books:

1. Nagrath IJ, Kothari D.P., “Power System Engineering”, Tata Mc-Graw Hills, New Delhi 1994
2. PrabhaKundur, “Power system stability and control”, Mc-Graw Hill Inc, New York, 1993

References:

1. Taylor C.W., “Power System Voltage Stability”, Mc-Graw Hill Inc, New York, 1993.
2. Weedy B.M. “Electric Power System” John Wiley and Sons, 3rd edition
3. Elgerd O.I., “Electric Energy Systems Theory”, TMH, New Delhi, Second Edition 1983.
4. P.S.R. Murthy, “Power System Operation and Control”, Tata Mc-Graw Hill, New Delhi 1984.

EIE 002: Biomedical Instrumentation

L T P: 4-1-0 **Credit: 4**

UNIT 1: Human Body Subsystems **4**

Brief description of neuronal, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities.

UNIT 2: Transducers and Electrodes **4**

Principles and classification of transducers for biomedical applications; Electrode theory, different types of electrodes.

UNIT 3: Cardiovascular System Measurements **4**

Measurement of blood flow, cardiac output, cardiac rate, heart sounds; Electrocardiograph; Phonocardiograph; Plethymograph; Echo-cardiograph.

UNIT 4: Respiratory System Measurements **4**

Measurement of gas volume, flow rate, carbon-dioxide and oxygen concentration in exhaled air.

Unit 5: Instrumentation for Clinical Laboratory **4**

Measurement of pH value of blood, ESR measurement, haemoglobin measurement, O_2 and CO_2 concentration in blood, GSR measurement, polarographic measurements.

UNIT 6: Measurement of Electrical Activity in Neuromuscular System and Brain **4**

Neuron potential, muscle potential, electromyograph, brain potentials, electroencephalograph.

UNIT 7: Medical Imaging **4**

Diagnostic X-rays, CAT, MRI, thermography, ultrasonography, medical use of Isotopes, endoscopy.

UNIT 8: Patient Care, Monitoring and Safety Measures, Prosthetics and Orthotics **5**

ICU, Introduction to artificial kidney, artificial heart, heart lung machine, limb prosthetics and orthotics.

UNIT 9: Assisting and Therapeutic Devices **3**

Introduction to cardiac pacemakers, defibrillators, ventilators, muscle stimulators, diathermy.

Contd.....

Reference Books:

1. Geddes L. A. and Baker L. E., “Principles of Applied Biomedical Instrumentation”, John Wiley & Sons,1989

2. Khandpur R. S., “Handbook on Biomedical Instrumentation”, 2nd Ed., Tata McGraw-Hill, 2008
3. Cromwell L., Weibell F. J. and Pfeifer E. A., “Biomedical Instrumentation and Measurements”, Prentice Hall of India, 2003
4. Aston R., “Principles of Biomedical Instrumentation and Measurements”, Macmillan, 1991.
5. Antoui H., Chilbert M. A., & Sweeny J. D., “Applied Bioelectricity”, Springer-Verlag, 1998.
6. Hill D. W. and Dolan A. M., “Intensive Care Instrumentation”, 1982.

EEE 009:Power System Deregulation

L T P: 4-1-0 **Credit: 4**

UNIT 1: Power System Restructuring **8**

Unbundling of power sector, market regulation, connection and use of system charges, traditional central utility model, independent system operator (ISO), retail electric providers.

UNIT 2: Power Sector Markets **10**

Wholesale electricity markets, characteristics, bidding, market clearing and pricing, ISO models, market power evaluation, demand side management.

UNIT 3: Transmission System Operation **12**

Role of the transmission provider, multilateral transaction model, power exchange and ISO - functions and responsibilities, classification of ISO types, trading arrangements, power pool, pool and bilateral contracts, multilateral trades.

UNIT 4: Transmission Pricing **10**

Transmission pricing in open access system, marginal pricing methods, zonal pricing, embedded cost recovery, open transmission system operation, and congestion management in open access transmission systems in normal operation.

Text Books:

1. Loi L. L., “Power System Restructuring and Deregulation – Trading, Performance and Information Technology”, John Wiley & Sons, 2003
2. Bhattacharya K., Bollen M.H.J and Daalder J.E., “Operation of Restructured Power Systems”, Kluwer Academic Publisher, 2001

Reference Books:

1 Fred C. S., Michael C. C., Richard D. T. and Roger E. B., “Spot Pricing of Electricity”, Kluwer Academic Publishers, 1988
2. Marija I., Francisco G. and Lester F., “Power Systems Restructuring: Engineering and Economics”, Kluwer Academic Publishers, 1998

B. Tech.

in

Electronics and Instrumentation Engineering

(7^{th} and 8^{th} Terms Only)

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Electronics and Instrumentation Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Electronics and Instrumentation Engineering	
School:	School of Engineering and Technology	
Name of the Course:	B. Tech. in Electronics and Instrumentation Engineering	
Duration:	Four years	
Total number of Credits:	54 (final year only)	
Date of Meeting of BOS:	14-16, March, 2011	
Members of BOS:	1. Prof. O.P.Bajpai	Chairman
	2. Prof. Surekha Bhanot, BITS, Pilani	Ext. Member
	3. Ms. Suman Lata	Int. Member
	4. Mr. C. Mohan, Asstt. Professor	Int. Member
	5. Ms. Ranjeeta Singh	Int. Member
	6. Ms. Priyanka Gupta	Int. Member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

COURSE STRUCTURE

B.Tech. in Electronics and Instrumentation Engineering with specialization in Instrumentation & Control

SEMESTER	Courses (L-T-P) Credits							L. Courses	Contact Hr/Week				Credits
									L	T	P	Total	
VII	Humanities and Management (3-1-0) 4	Open Elective 2 (3-1-0)4	Process Control (3-1-2) 5	Computer Controlled Process (3-1-2) 5	Departmental Elective 5 (3-1-0)4	Departmental Elective 6 (3-1-0)4	Seminar (0-0-2) 4	**6**	**18**	**6**	**6**	**30**	**30**
VIII	Humanities and Management (3-1-0) 4	Open Elective 3 (3-1-0)4	Departmental Elective-7 (3-1-0) 4	Departmental Elective-8 (3-1-0) 4	Project (0-0-8) 8			**4**	**12**	**4**	**8**	**24**	**24**

Total Credits- 54

LIST OF DEPARTMENTAL ELECTIVES

Elective 5:

1. Biomedical Signal Processing
2. Digital Image and Speech Processing

Elective 6:

3. Advanced Engineering Materials
4. Mobile Computing
5. Data Structure using C

Elective 7:

6. Power plant Instrumentation
7. Optoelectronic Instrumentation

Elective 8:

8. Advanced Control Systems
9. Soft Computing Techniques and applications

LIST OF OPEN ELECTIVES

Nil

B.Tech.

in

Electronics and Instrumentation Engineering

SYLLABI

(Final Year Only)

EIE401: Process Control

L T P: 3-1-0 **Credits: 4**

UNIT 1: Introduction and Mathematical Modeling of Process (10)

Need for process control – Mathematical model of first order liquid level and thermal processes – Higher order process – Process with dead time, process with inverse response – Interacting and non-interacting systems – Continuous and batch process – Servo and regulator operation.

UNIT 2: Controller Principles (7)

Introduction, Process characteristics, control system parameters, discontinuous controller modes, continuous controller modes, composite control modes.

UNIT 3: Controller Design (4)

Hydraulic, Pneumatic and Electronic Controllers, Digital Controllers.

UNIT 4: Signal Conversations, Actuators & Control Valves (10)

I/P converter – Pneumatic and electric actuators – Valve positioner – Control valves characteristics – Classification of control valves – Globe, Butterfly, diaphragm, Ball valves – Control valve sizing – Cavitations, flashing-problems.

UNIT 5: Complex Control (9)

Cascade control – Feed forward control – Ratio control – Selective control systems – Split range control – Adaptive and inferential control. "Multivariable interactions : RGA Matrix, decouplers

Text Books:

1. Johnson Curtis , Process Control Instrumentation Technology, , Prentice Hall of India, 7th edition.

Reference Books:

1. Stephanopoulos G Chemical process Control: An introduction to theory and practice,
,Prentice Hall of India, ISBN-81-203-0665-1.
2. S K Singh, Computer Aided Process Control, Prentice Hall of India,

EIE 402: Computer Controlled Process

L T P: 3-1-0 **Credits: 4**

UNIT 1: Basics of PLC **(12)**

PLC Fundamentals –-Evolution of modern day PLCs building blocks of PLCs-PLC Applications-Programming methods- Relay & logic ladder diagrams-Boolean logic-High level languages-Graphical representation- programming examples – Comparative study of industrial PLCs. Communication in PLCs

UNIT 2: Introduction to DCS **(11)**

Elements of DCS –Evolution of DCS - Building blocks- Detailed descriptions andfunctions of field control units-Operator stations and data highways-Redundancy concepts. Case studies in DCS-Comparative study of industrial DCS-Reliability calculations - intrinsically safe instrumentation –Case studies

UNIT 3: DCS networks **(9)**

Communications in DCS - Basics of Computer networks - Special requirements of network used for control - Communication protocols-link access mechanism-Manufactures automation protocols - Field bus and Smart transmitters.

UNIT 4: Introduction to SCADA **(8)**

Introduction to SCADA, configuration of different drivers, gateway. Database of tags and its use. Interfacing with PLC and simulation of PLC application in SCADA.

Text Books :

1. Lukcas M.P., Distributed control systems, Van Nostrand Reinhold co., Newyork,1986.
2. Huges T, Programmable Logic Controllers, ISA press,1994.

Reference Books:

1. Moore, Digital control devices, ISA press, 1986.
2. Tanaenbaum A.S., Computer networks, Prentice Hall, 1998.

EIE 004: Biomedical Signal Processing

L T P: 3-1-0 **Credits:4**

UNIT 1: Bio potentials **(10)**

Introduction to Bio-Medical Signals: Origin of bio-potentials, signals of biologicalorigin, ECG, EMG, EEG, ExG and their spectral properties. Classification, Acquisition and Difficulties during Acquisition. Role of Computers in the Analysis, Processing, Monitoring & Control and image reconstruction in bio-medical field.

UNIT 2: Analysis of ECG **(6)**

ECG: Measurement of Amplitude and Time Intervals, QRS Detection(Different Methods), ST Segment Analysis, Removal of Baseline Wander And Power line Interferences, Arrhythmia Analysis, Portable Arrhythmia Monitors.

UNIT 3: Analysis of EEG **(10)**

EEG:Neurological Signal Processing, EEG characteristic, linear prediction theory, Sleep EEG, Dynamics of Sleep/Wake transition. Study of pattern of brain waves, Epilepsy-Transition, detection and Estimation. EEG Analysis By Spectral Estimation: The Bt Method, Periodogram, -Maximum Entropy Method & AR Method, Moving Average Method. The ARMA Methods, - Maximum Likelihood Method.

UNIT 4: Filters for Bio-potentials **(5)**

Inverse filtering- Deconvolution and equalization techniques-Weiner, Linearprediction etc., Signal reconstruction. Time frequency analysis - STFT, WT, DSP hardware - Design methodologies

UNIT 5: Estimation of Signals **(9)**

EP Estimation: by Signal Averaging, Adaptive Filtering:- General Structures of Adaptive filters, LMS Adaptive Filter, Adaptive Noise Canceling, Wavelet Detection:- Introduction, Detection By Structural features, Matched Filtering, Adaptive Wavelet Detection, Detection of Overlapping Wavelets.

Text Books :

1. Willis J Tomkin ,Biomedical Digital Signal Processing, , PHI.
2. D.C Reddy ,Biomedical Signal Processing, McGrawhill
3. Crommwell, Weibel and Pfeifer Biomedical Instrumentation and Measurement, ,PHI

Reference Books :

1. Arnon Cohen Biomedical Signal Processing, , volume I & Licrc Press
2. 2 Rangaraj M. Rangayyan, Biomedical Signal Analysis A Case Study Approach, John Wiley and Sons Inc.
3. 3.john G. Webster, Medical instrumentation Application and Design, john Wiley &Sons Inc.

EIE 005: Digital Image and Speech Processing

L T P: 3-3-0 **Credits: 4**

UNIT1: Introduction and Digital Image fundamentals (8)

The origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamentals Steps in Image Processing, Elements of Digital Image Processing Systems, Image Sampling and Quantization, Some basic relationships like Neighbors, Connectivity, Distance Measures between pixels, Linear and Non Linear Operations

UNIT 2 Image Enhancement in the spatial Domain (8)

Some basic Gray Level Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods. Image Enhancement in the Frequency Domain Introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering.

UNIT 3 : Image Restoration (9)

Image Restoration A model of The Image Degradation / Restoration Process, Noise Models, Restoration in the presence of Noise Only Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Linear Position-Invariant Degradations, Estimation of Degradation Function, Inverse filtering, Wiener filtering, Constrained Least Square Filtering, Geometric Mean Filter, Geometric Transformations.

UNIT 4: Introduction of Speech and Parameters (7)

Overview of Speech Technology; What is Speech Technology; Why is it important; Applications and issues. Speech Production; Mechanism of speech production; Categories of sounds; Sound units in Indian languages. Nature of Speech Signal; Source-system characteristics; Segmental and suprasegmental features; Temporal and spectral parameters for sound units in Indian languages

UNIT 5: Speech Processing (8)

Speech Signal Processing Methods: Short-time spectrum analysis; Spectrograms; Linear prediction analysis; Cepstrum analysis. Speech Recognition; Isolated word recognition; Connected word recognition Continuous Speech Recognition; Speech recognition problem; Hidden markov models. Other Applications: Word spotting; Speaker recognition; Speech enhancement; Speech synthesis; Practical issues in speech technology.

Text Books :

1. Rafael C Gonzalez, Richard E Woods 2nd Edition, Digital Image Processing - Pearson Education 2003.

2.L.R.Rabiner,Ronald W.Schafer, “Digital Processing of Speech Signal”Prentice Hall

Reference Books:

1. William K Pratt, Digital Image Processing John Willey (2001)

2. Image Processing Analysis and Machine Vision – Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, Thompson Learniy (1999).

3. A.K. Jain, PHI, New Delhi (1995)-Fundamentals of Digital Image Processing. India

4. Jacob Benesty, M. Mohan Sondhi, Yiteng Huang , “Springer Handbook of Speech Processing” Prentice Hall

EIE 006: Advanced Engineering Materials

L T P: 3-1-0 **Credits: 4**

UNIT 1: Classes of Materials (7)

The Classes of Material, The Structure of Atoms, Atomic and Molecular orbital of electrons, The electronic structure of the solid: Energy Band and Chemical bonds, Metal, Ceramics, Polymers and Secondary Bonds, Bond Energy and the distance between Atoms, Structural Materials, functional Materials, and Biomaterials.

UNIT 2: Structural Materials (8)

Ceramics: the types of Ceramics and their defining Properties, traditional ceramics, Synthetic High- Performance Ceramics, the crystal Structures of Ceramics, Glass, cement and concrete

Polymers: Definition of a Polymers, synthesis of polymers, thermoplastics, thermoset, Rubber(Elastomer) Copolymers, Application of Polymers

UNIT 3: Functional materials (15)

Conductors, Insulators, and Semiconductors: Introduction, Basic Concept of Electric Conduction, The Density of Mobile Electrons and the Pauli Exclusion Principle, Electron Scattering and the Electric Resistance of Metals, Insulators and Semiconductors.

Fabrication of Integrated Circuits and Micro- Electro- Mechanical Systems (MEMs)

A chip and its Millions of Transistors, Growth of Silicon Single Crystals, Photolithography, Packaging, Oxide Layers, Photoresist , The Mask, Etching , Doping by Ion Implantation, Deposition of Interconnects and Insulation Films, MEMS(Micro-Electro- Mechanical Systems)

Optical Materials: Uses of Optical Materials, Light and Vision, Interaction of Light with Electrons in Solids , Dielectric Optical Coatings, Electro-Optical devise, Optical Recording, Optical Communications.

Magnetic Materials: Uses of Magnets and the Required Material Properties, Magnetic Fields, Induction and Magnetization, Ferromagnetic Materials, Properties and Processing of Magnetic Materials.

Batteries: Batteries, Principle of Electrochemistry, Primary Batteries, Secondary or rechargeable Batteries, Fuel Cells, Ultra Capacitors.

UNIT 4: Biomaterials **(2)**

Biomaterials, Metals, Ceramics, Polymers

UNIT 5: Environmental Interactions **(8)**

The Electrochemical Nature of Corrosion in Liquids, Electrode potentials in Variable Ion Concentrations, Cathodes in Aqueous Corrosion, Farady‟s Law- Corrosion Rate, other Forms of Corrosion. Preventing corrionsion through Design, Gaseous Oxidation, Wear

Text Books :

1.Traugott E. Fischer ,Materials science for engineering students , Academic Press

EIE 007: Power Plant Instrumentation

L T P: 3-1-0 **Credits: 4**

UNIT 1: Overview of Power Generation (10)

Various Sources of Electrical Energy, Non-Conventional and Conventional Energy Sources, Importance of Instrumentation and Control, Piping and Instrumentation Diagram, Cogeneration of Power,, Control Room

UNIT 2: Instrumentaion and Control Water (6)

Boiler feed water circulation, Measurement and Control in water circuit, Impurities in Water and Steam

UNIT 3: Instrumentation and Control in Air Fuel Circuits (7)

Control & Measurements in Air fuel circuit , Analytical Measurement in Air-fuel circuit

UNIT 4: Power Plant management (10)

Master Control, Combustion process, Boiler efficiency, Maintenance of Measuring Instruments, Intrinsic and Electrical Safety, Computer based control and data logging system

UNIT 5 :TURBINE MONITORING AND CONTROL (7)

Turbine stream inlet system, Turbine Measurements, Turbine Control System

Text Books:

1. Power plant Instrumentation by krishnaswamy, PHI Publication-2011

2. Power plant Control and Instrumentation by David Lindsly, IEE control

EIE 008: Optoelectronic Instrumentation

L T P: 3-1-0 **Credits:4**

UNIT 1: Light Sourcing , Transmitting, and Receiving (8)

Concept of Light, Classification of different phenomenon based on theories of light, Basic light sources and its Characterization, Polarization, Coherent and Incoherent sources, Grating theory ,Application of diffraction grating, Electro-optic effect Acoustooptic effect and Magneto-optic effect.

UNIT 2: Opto Electronic Devices and Optical Components (10)

Photo diode, PIN, Photo-Conductors, Solar cells,, Phototransistors, Materials used to fabricate LEDs and Lasers Design of LED for Optical communication, Response times of LED‟S ,LED drive circuitry, Lasers Classification :Ruby lasers, Neodymium Lasers, He- Ne Lasers,CO2 Lasers, Dye Lasers, Semiconductors Lasers ,Lasers Applications.

UNIT 3 : Interferometry (9)

Interference effect, Radiometry, types of interference phenomenon and its Application, Michelson‟s Interferometer and its application Fabry-perot interferometer, Refract meter, Rayleigh‟s interferometers, Spectrographs and Mono-chromators, Spectrophotometers, Calorimeters, Medical Optical Instruments

UNIT 4: Holography (5)

Principle of Holography, On-axis and off axis Holography, Application of Holography, Optical data storage.

UNIT 5 : Fiber Optic Fundamentals and Measurements (8)

Fundamental of Fibers: Fiber Optic Communication system, Optical Time domain Reflectometer (OTDR),Time domain dispersion measurement, Frequency Domain dispersion measurement, Laser Doppler velocimeter,
Optical Fiber Sensors : Active and passive optical fibre sensor ,Intensity modulated, displacement type sensors, Multimode active optical fiber sensor (Micro bend sensor)Single Mode fiber sensor-Phase Modulates and polarization sensors

Text Book :

1. J.Wilson &J F B Hawkes, Opto- Electronics, An Introduction PHI,Edition
2. Rajpal S.Sirohi ,Wave Optics and its Application
3.A Yariv ,Optical Electronics/C.B.S. Collage Publishing, New York, 1985

EIE 011: Soft Computing Techniques and Applications

L T P: 3-1-0 **Credits:4**

UNIT 1 : Introduction to Neural Networks (10)

Introduction to Neural Networks: Artificial Neural Networks: Basic properties of Neurons, Neuron Models, Feed forward networks – Perceptrons, widrow-Hoff LMS algorithm; Multilayer networks – Exact and approximate representation, Back propagation algorithm, variants of Back propagation, Unsupervised and Reinforcement learning; Symmetric Hopfield networks and Associative memory; Competitive learning and self-organizing networks, Hybrid Learning; Computational complexity of ANNs.

UNIT 2 : Neural Networks Based Control (8)

Neural Networks Based Control: ANN based control: Introduction: Representation and identification, modeling the plant, control structures – supervised control, Model reference control, Internal model control, Predictive control: Examples – Inferential estimation of viscosity an chemical process, Auto – turning feedback control, industrial distillation tower.

UNIT 3 : Introduction to Fuzzy Logic (6)

Introduction to Fuzzy Logic: Fuzzy Controllers: Preliminaries – Fuzzy sets and Basic notions – Fuzzy relation calculations – Fuzzy members – Indices of Fuzziness – comparison of Fuzzy quantities – Methods of determination of membership functions.

UNIT 4 : Fuzzy Logic Based Control (7)

Fuzzy Logic Based Control: Fuzzy Controllers: Preliminaries – Fuzzy sets incommercial products – basic construction of fuzzy controller – Analysis of static properties of fuzzy controller – Analysis of dynamic properties of fuzzy controller – simulation studies – case studies – fuzzy control for smart cars.

UNIT 5 : Neuro-Fuzzy and Fuzzy-Neural Controllers (9)

Neuro – Fuzzy and Fuzzy – Neural Controllers: Neuro – fuzzy systems: A unified approximate reasoning approach – Construction of role bases by self-learning: System structure and learning algorithm – A hybrid neural network based Fuzzy controller with self-learning teacher. Fuzzified CMAC and RBF network based self-learning controllers.

Text Books*:*

1. Bose and Liang, Artificial Neural Networks, Tata Mcgraw Hill, 1996.

2. Kosco B, Neural Networks and Fuzzy Systems: A Dynamic Approach to Machine Intelligence, Prentice Hall of India, New Delhi, 1992.

Reference Books:

1. Klir G.J and Folger T.A, Fuzzy sets, Uncertainty and Information, Prentice Hall of India, New Delhi 1994.

2. Simon Haykin, Neural Networks, ISA, Research Triangle Park, 1995.

EIE 009: Advanced Control Systems

L T P: 3-1-0 **Credits: 4**

UNIT1: State Space Analysis of Discrete time systems (8)

Concepts of State, State variable and State space model- State space representation of linear continuous time systems using physical variables, phase variables and canonical variables-digitalization-State space representation of discrete time systems-Solution of state equations-computation of state transition matrix.

Concepts of Controllability and Observability – linear time invariant systems-pole placement by state feedback- Ackerman‟s Formula-Observers-full order and reduced order.

UNIT2 : Non Linear System (10)

Fundamentals-common nonlinearities (saturation, dead-zone, relay, on-off non-linearity, backlash, Hysteresis) -Describing function analysis of non-linear systems-phase plane method-singular points-phase trajectories

Liapunov Stability Autonomous Systems: Stability of equilibrium point. Concepts of positive definite/semi definite, negative definite/ semi definite, indefinite functions, Lyapunov function Liapunov Stability: asymptotic stability, global asymptotic stability. Linear systems, linearization of nonlinear systems about equilibrium point. Liapunov's indirect method. Stability analysis of nonlinear system using Liapunov's theorem.

UNIT 3: Digital Controller Design (5)

Pole placement – estimation design – regulation design – Integral control and disturbance estimation – design by emulation – root locus design – direct design method – frequency response methods.

UNIT 4 : Performance Measures of Optimal Control (6)

Linear optimal control with quadratic performance index , Selection of performance measure ,Formulation of the optimal control Problem, State and output regulators, Optimal State Regulator with matrix Ricati equation, Use of State Regulator results, Eigenvalue Assignment by State feedback, State observers.

UNIT 5: OPTIMAL FEEDBACK CONTROL (8)

Discrete-Time linear State regulator, Continuous-Time Linear state Regulator results of solve other linear problems, Suboptimal Linear regulators, Minimum-time Control of Linear Time-Invariant System

UNIT 6: Stochastic Optimal Linear Estimation and Control (3)

Stochastic processes and linear systems, Optimal Estimation for Linear Discrete time Systems Stochastic Optimal Linear Regulator,

Text Books :

1. M. Gopal, “Modern Control Engineering”, New Age International Publishers.

2. B.C. Kuo ,“Digital Control Systems”, Oxford University Press

Reference Books :

1. Brain D.O. Anderson, John B. Moore, “Optimal control Linear Quadratic Methods”, Prentice Hall of India Private Limited

Annexure-XXII-A of Agenda Item no. 6.21

B.Tech.
in
Information Technology
with specialization in
Software Engineering or Networking

COURSE STRUCTURE & SYLLABI

(of 7th & 8th Semesters)

(Valid for Batch 2009-10, 2010-11,2011-12)
(Addition in Departmental Elective & Changes in Open Electives)

Department of Information Technology
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Information Technology
School:	School of Engineering and Technology
Name of the Course:	B.Tech. in Information Technology with Specialization in Software Engineering or Networking
Duration:	Four years
Total No. of Credits:	220
Date of Meeting of BOS:	May 19, 2012
Members of BOS:	1. Prof. A.K.Soni, HOD — Chairman 2. Dr. P.S Grover, Ex-Professor, Delhi University — Ext. Member 3. Dr. Pervez Ahmed , CSE — Int. Member 4. Ms. Manisha Singh, IT — Int. Member 5. Mr. Surendra Singh Chahar, IT — Int. Member 6. Mr. Amit Kumar Upadhyay, IT — Int. Member
Date of Meeting of Faculty Board:	May 19, 2012
Status :	Approved by BOS and Faculty Board

COURSE STRUCTURE

Information Technology

SEMESTER	Courses (L-T-P) Credits							L. Courses	Contact Hr./ Week				Credits
									L	T	P	Total	
VII	Hum. & Mgmt (4-1-0) 4	Internet & Web Technology (4-1-2) 5	Distributed Operating Systems (4-1-2) 5	Departmental Elective-5 (4-1-0) 4	Departmental Elective-6 (4-1-0) 4	Open Elective-2 (4-1-0) 4	Technical Seminar (.NET with C#) (4-0-0) 4	7	28	6	4	38	30
VIII	Hum. & Mgmt (4-1-0) 4	Departmental Elective-7 (4-1-0) 4	Departmental Elective-8 (4-1-0) 4	Open Elective-3 (4-1-0) 4	Project (0-0-16) 8			5	16	4	16	36	24

Total Credits (Semster I – Semester VIII) - 220

LIST OF DEPARTMENTAL ELECTIVES (7th & 8th Semester)

1. Mobile Computing
2. Web Engineering
3. Data Warehousing & Data Mining
4. Software Project Management
5. Introduction to Digital Signal Processing
6. Managing Information Systems
7. Introduction to Parallel Computing
8. Digital Image Processing
9. Cloud Computing – Services & Applications

LIST OF OPEN ELECTIVES

1. Computer and Society
2. E-Commerce
3. Cyber Laws

B.Tech.

in

Information Technology
with specialization in
Software Engineering or Networking

SYLLABI

(7^{th} & 8^{th} Semesters)

INT 401: Internet & Web Technology

L T P : 4-1-0 **Credit : 4**

Unit 1 : Introduction **(10)**

History of the web, Growth of the Web, Protocols governing the web, Introduction to Cyber Laws in India, Introduction to International Cyber laws, Web project, Web Team, Team dynamics.
Communication Issues, the Client, Multi-departmental & Large scale Websites, Quality Assurance and testing, Technological advances and Impact on Web Teams.

Unit 2 : Web Page Designing and Scripting **(8)**

HTML: Formatting Tags, Links, List, Tables, Frames, Forms, Comments in HTML, DHTML.
JavaScript: Introduction, Documents, Documents, Forms, Statements, Functions, Objects in JavaScript, Events and Event Handling, Arrays, FORMS, Buttons, Checkboxes, Text fields and Text areas.

Unit 3 : XML **(8)**

XML: Introduction, Displaying an XML Document, Data Interchange with an XML document, Document type definitions, Parsers using XML, Client-side usage, Server Side usage

Unit 4 PHP (Hypertext Preprocessor) **(8)**

Introduction, Syntax, Variables, Strings, Operators, if-else loop, Switch, Array, Function, Form, Mail, File upload, Session, Error, Exception, Filter, PHP-ODBC.

Unit 5 : Common Gateway Interface (CGI) **(6)**

PERL, RMI, COM/DCOM, VB Script, Active Server Pages (ASP).

Text Books:

1. Ivan Bayross, " HTML, DHTML, Java Script, Perl & CGI", BPB Publication
2. Burdman, "Collaborative Web Development", Addison Wesley

Reference Books:

1. Xavier, C, " Web Technology and Design" , New Age International
2. Ullman, "PHP for the Web: Visual Quick Start Guide", Pearson Education
3. Deitel, "Java for programmers", Pearson Education

INT 402: Distributed Operating Systems

L T P : 4-1-0 **Credit : 4**

Unit 1: Introduction **(8)**

Introduction to Distributed System, Goals of Distributed system, Hardware and Software concepts, Design issues, Communication in distributed system: Layered protocols, ATM networks,

Unit 2: Distributed Operating Systems **(8)**

Client – Server model ,Remote Procedure Calls and Group Communication. Middleware and Distributed Operating Systems.

Unit 3: Synchronization in Distributed System **(8)**

Clock synchronization, Mutual Exclusion, Election algorithm, The Bully algorithm, Ring algorithm, Atomic Transactions, Deadlock in Distributed Systems, Distributed Deadlock Prevention, Distributed Deadlock Detection .

Unit 4: Processes and Processors in distributed systems **(8)**

Threads, System models, Processors Allocation, Scheduling in Distributed System, Real Time Distributed Systems.

Unit 5: Distributed file systems **(8)**

Distributed file system Design, Distributed file system Implementation, Trends in Distributed file systems. Distributed Shared Memory**:** Shared memory, Consistency models, Page based distributed shared memory, Shared variables, Distributed shared memory.

Text Books :

1. Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill
2. Tanenbaum, S.,” Distributed Systems”, PHI

Reference Books :

1. Ramakrishna,Gehrke,” Database Management Systems”, Mc Grawhill
2. Coulouris, Dollimore, Kindberg, "Distributed System: Concepts and Design”, Pearson Education
3. Gerald Tel, "Distributed Algorithms", Cambridge University Press

INT 453: Technical Seminar
(. NET WITH C# PROGRAMMING)

L T P : 4-1-0 **Credit : 4**

Unit 1: .NET Technology **(10)**

Introduction, Use, Advantages, Its applications, Understanding CLR, Just-in-time (JIT) compiler, MSIL (Microsoft Intermediate Language), Common Type System, Common Language specification, Languages under .NET(definitions only), The Base Class Library, Assemblies, Versioning, Unified Classes.

Unit 2: C# Introduction **(6)**

Introduction to C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations, Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

Unit 3: Database programming with ADO.NET **(8)**

Introduction to ADO Technology, ADO vs. ADO.NET, Types of ADO .NET , Operations and Name Spaces System Data, System. Data. Odbc, System. Data. OleDb , System .Data .SqlClient ,ADO.NET classes, Data retrieval methods, Connected - Disconnected operation, Components of ConnectionString.

Unit 4: Web Programming with ASP.NET **(8)**

Web Programming Concepts: Introduction to Web Programming, Client/Server technology in Internet Environment, Understanding Web Server IIS ,Working of Internet and Intranet , Creating Virtual Directory and Websites, Programming Web Applications with Web Forms, Programming Web Services..

Unit 5: Data Access using ASP.NET **(8)**

Data Source controls, Access Data Source, Sql Data Source, Database operations with Data Source controls Insertion, Updation, Deletion, Selection, Validation Controls in ASP.NET **,**Introduction, Required Field Validator, Range Validator, Compare Validator, Regular ExpressionValidator, CustomValidator , Validation Summary, Intrinsic Objects under ASP.NET : Request object, Response object, View State object.

Text Books:

1. Balagurusamy, “Programming with C#” ,TMH

Reference Books:

1. Jeffrey Richter,”Applied Microsoft .Net Framework programming”
2. Fergal Grimes,” Microsoft .Net for Programmers”(SPD)

DEPARTMENTAL ELECTIVE-5 (General) [Option 1]
INT 005: Mobile Computing

L T P : 4-1-0 **Credit : 4**

UNIT 1: WIRELESS COMMUNICATION FUNDAMENTALS **(7)**
Introduction to wireless communication, Wireless transmission, Frequencies for radio transmission, Signals, Antennas, Signal Propagation, Multiplexing, Modulations, Spread spectrum, MAC, SDMA , FDMA , TDMA , CDMA,CellularWirelessNetworks.

UNIT 2: TELECOMMUNICATION NETWORKS **(8)**
Telecommunication Systems, GSM Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, New data services, CDMA, GPRS.

UNIT 3: WIRLESS LAN **(8)**
Wireless LAN : IEEE 802.11: Architecture, Services, MAC, Physical layer , IEEE 802.11a - 802.11b standards, HIPERLAN, Blue Tooth.

UNIT 4: MOBILE NETWORK LAYER **(9)**
Mobile IP : Dynamic Host Configuration Protocol ,Ad Hoc networks, Routing protocols: Global State Routing (GSR), Destination sequenced distance vector routing (DSDV), Dynamic source routing (DSR), Ad Hoc on demand distance vector routing (AODV), Temporary ordered routing algorithm (TORA), QoS in Ad Hoc Networks, Applications.

UNIT 5: TRANSPORT AND APPLICATION LAYERS **(8)**
Traditional TCP , Classical TCP improvements , WAP, WAP 2.0.

Text Books:

1. Jochen Schiller, “Mobile Communications”, PHI/Pearson Education, Second Edition, 2003.
2. William Stallings,“Wireless Communications and Networks”, PHI/Pearson Education, 2002.

Reference Books:

1. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, New York, 2003.
2. Hazysztof Wesolowshi, “Mobile Communication Systems”, John Wiley and Sons Ltd, 2002.

DEPARTMENTAL ELECTIVE-5 (General) [Option 2]
INT 006: Web Engineering

L T P : 4-1-0 **Credit : 4**

Unit 1: **Information Architecture** **(7)**

Role of Information Architect, Collaboration and Communication, Organizing Information, Organizational Challenges, Organizing Web sites and Intranets, Creating Cohesive Organization Systems

Unit 2: **Designing Navigation Systems** **(9)**

Types of Navigation systems, Integrated Navigation Elements, Remote Navigation Elements, Designing Elegant Navigation Systems, Searching Systems, Searching your Web Site, Designing the Search Interface, Indexing the Right Stuff, To search or Not To Search, Grouping Content, Conceptual Design, High-Level Architecture Blueprints, Architectural Page Mockups, Design Sketches.

Unit 3: **Dynamic HTML** **(8)**

HTML Basic Concepts, Good Web Design, Process of Web Publishing, Phases of Web Site development, Structure of HTML documents, HTML Elements-Core attributes, Language attributes, Core Events, Block Level Events, Text Level Events, Linking Basics, Linking in HTML,
Overview of advance features of XML.

Unit 4: **Web Designing** **(8)**

Images and Anchors, Anchor Attributes, Image maps, Semantic Linking Meta Information, Image Preliminaries, Image Download Issues, Image as Buttons, Introduction to Layout: Backgrounds, Colors and Text, Fonts, Layout with Tables. Advanced Layout: Frames and Layers, HTML and other media types. Audio Support in Browsers, Video Support, Other binary Formats. Style Sheets, Positioning with Style sheets. Basic Interactivity and HTML: FORMS, Form Control, New and emerging Form elements.

Unit 5: Java Server Pages and Active Server Pages **(8)**

Basics, Integrating Script, JSP/ASP Objects and Components, configuring and troubleshooting,: Request and response objects, Retrieving the contents of a an HTML form, Retrieving a Query String, Cookies, Creating and Reading Cookies. Using application Objects and Events.

Text Books:

1. Kappel, G., Proll, B. Reich, S. & Retschitzegger, W., Web Engineering, Hoboken, NJ: Wiley & Sons.
2. Doug Tidwell, James Snell, Pavel Kulchenko; Programming Web Services with SOAP, O' Reilly
3. HTML The complete Reference, TMH

Reference Books:

1. Eric Ladd, Jim O'Donnell, Que, Using XHTML 4 - XML - Java 2 – Platinum, Que, ISBN: 07897-2473
2. Pardi, XML in Action, Web Technology, PHI

DEPARTMENTAL ELECTIVE-6 (General) [Option – 1]
INT 007: Data Warehousing & Data Mining

L T P : 4-1-0 **Credit : 4**

Unit 1: Introduction to Data Warehousing **(8)**
Concept of Data Warehouse, DBMS verses data warehouse, Data Marts, Metadata, Multidimensional data model, Data cubes, Multidimensional database, Schemas for Multidimensional Database: stars, snowflakes and fact constellations. Data warehouse Measures, their categorization and computation, Multi-dimensional database hierarchies, Operations in OLAP. Advantages of OLAP over OLTP.

Unit 2: Data Warehouse Architecture **(8)**
Three-Tier Data Warehouse architecture, Types of OLAP Servers, Indexing OLAP data, Modeling OLAP data, OLAP queries manager, processing of OLAP queries, ROAP, .MOAP & HOAP. Distributed and Virtual Data Warehouses, Data Warehouse Manager. Computation of data cubes and multi dimensional presentation.

Unit 3: **Data Warehouse Implementation** **(8)**
Data warehouse backend tools and utilities, discovery-driven exploration of data cube, complex aggregation at multiple granularities, Data preprocessing: Data cleaning, Data integration and transformation, Tuning and Testing of Data Warehouse, Future trends

Unit 4: Introduction to Data Mining **(8)**
Data Processing; Noisy Data, Basic concepts of Data Mining; Data Mining primitives: Task-relevant data, mining objective, measures and identification of patterns, KDD versus data mining, data mining tools and applications. Data Mining Query Languages: Data specification, specifying kind of knowledge, hierarchy specification, pattern presentation & visualization specification, data mining languages and standardization of data mining, Architectures of Data Mining Systems.

Unit 5: Data Mining Techniques **(8)**
Association rules: Association rules from transaction database & relational database, correlation analysis; Classification and predication using decision tree induction. Clustering techniques. Knowledge discovery through Fuzzy logic, Neural Network & Genetic Algorithm

Text Books:
1. Data Mining- Concepts & Techniques: Jiawei Han & Micheline Kamber, Morgan Kaufmann.
2. Data Warehousing in the Real World: Sam Anahory & Dennis Murray, Pearson Education

Reference Books:
1. Data Warehousing, Data Mining and OLTP: Alex Berson, 1997, MGH.
2. Data Mining: Introductory and advance topics: M.H. Dunham; Pearson Education.

DEPARTMENTAL ELECTIVE-6 (General) [Option – 2]
INT 008: Software Project Management

(Syllabus of Departmental Elective-7 (Software Engineering Stream)) will be used.

DEPARTMENTAL ELECTIVE-7 (General) [Option – 1]

INT 009: Introduction to Digital Signal Processing

L T P : 4-1-0 **Credit : 4**

Unit 1: Discrete Time Signals **(8)**

Signal classifications, frequency domain representation, Time domain representation, Representation of sequences by Fourier transform, Properties of Fourier transform, Discrete time random signals, Energy and Power theorems.

Unit 2: Discrete Time Systems **(8)**

Classification, Properties, Time invariant system, finite impulse Response (FIR) system, Infinite impulse response (IIR) system.

Sampling of Time signals:Sampling theorem, application, frequency domain representation of sampling, reconstruction of band limited signal from its samples, Discrete time processing of continuous time signals, Changing the sampling rate using discrete time processing.

Unit 3: Z-Transform **(8)**

Introduction, Properties of the region of convergence, Properties of the Z-transform, Inversion of the Z-transform, applications of Z-transform.

Unit 4: Basics of Digital Filters **(8)**

Fundamentals of digital filtering, Various types of digital filters, Design techniques of digital filters:Window technique for FIR, Bi-linear transformation and Backward difference methods for IIR filter design, Analysis of finite word length effects in DSP, DSP algorithm implementation consideration, Applications of DSP.

Unit 5: Multirate Digital Signal Processing **(8)**

Introduction to multirate digital signal processing, Sampling rate conversion, filter structures, Multistage decimator and interpolators, Digital filter banks.

Text Books :

1. Digital Signal Processing : Proakis and Manolakis; PHI
2. Digital Signal Processing: Salivahanan, Vallavaraj and Gnanapriya;TMH

Reference Books:

1. Digital Signal Processing: Alon V. Oppenhelm;PHI
2. Digital Signal processing(II-Edition): Mitra, TMH

DEPARTMENTAL ELECTIVE-7 (General) [Option 2]

INT 010: Managing Information Systems

L T P : 4-1-0 **Credit : 4**

Unit 1: Introduction to Management Information System (8)

Concept of Information system, Basic Concepts of MIS, Emergence of MIS, Role of MIS in an organization; Decision Support and decision making system, MIS as a System, Role of MIS unit in an organization, Organizing Software support for MIS, Need of Automated MIS, Organizing Computer Setup & Computer Hardware & Software, Use of DBMS and other software.

Unit 2: Structures of Organizations Using MIS (8)

Types of Organizations: Service sector, Production sector, Business sector. Functional model of organization; organizational Behavior; Organization as a system, Decision making concepts, Decision making methods, Tools and procedures; Behavior concepts of decision making organizational decision making practices.

Unit 3: MIS System Design (8)

Information Concepts, Information as quality product, Classification of information, Methods of data and information collection, General model of information processing, System concepts, System controls, Types of systems, formulating MIS as a System.

System Analysis for MIS Design: Requirement analysis and analysis of existing system practices, Objective, Identification and layouts, Objectives and identifying constraints, Determining information needs and costs, Formulation of Inputs, Outputs and Reports.

Unit 4: Development of MIS (8)

Long range plan for MIS, Classification of Information requirements at various levels in the organization, Design of MIS, System Controls, Incorporating management views into system, Architecture of MIS and detailed layout of its components and models, Development and implementation of MIS, Testing system with sample data, Staff training and functional manuals, scheduling of activities, Reporting system and reporting specifications.

Unit 5: MIS as Decision Support System and Strategy Planning (8)

Concept of decision support system (DSS): DSS as deterministic system, DSS models and their working, Strategic management of organization, Strategic planning and tools of planning, Transforming strategies into MIS activities.

MIS Applications: MIS for service sector, Identification of work domain of service sector, objective of MIS in service sector creating MIS as distinctive service, Various activities of service sector into MIS, Developing procedures, manuals and documents.

Text Books:

1. Management Information System: W. S. Jawadekar, Tata McGraw Hill, 2002.
2. Information System for Modern Management (3rd edition): Robert G. Murdick, Loel E. Ross & James R. Claggett. PHI

Reference Books:

1. Management Information System: O Brian, TMH
2. Management Information System: Davis Olson Mac Graw Hill
3. Management Information System: Stallings,(Maxwell Mc Millman Publishers)
4. Information System; a Management Perspective: Alter Addison Wesley

DEPARTMENTAL ELECTIVE-8 (General)) [Option – 1]

INT 011: Introduction To Parallel Computing

L T P : 4-1-0 **Credit : 4**

Unit 1: Introduction to Parallel and Distributed Computer (10)

Introduction to Parallel Computing, Need of Parallel Computation, Levels of parallel processing. Moore's Law, Applications of parallel processing. Flynn's Taxonomy, Overview of VLIW and Super scalar architecture. Performance Measures: Granularity, Speed Up, Efficiency, Cost, Amdahl's Law, Gustafson's Law. Parallel Computation Models, PRAM, Modeling Communication, Cluster Cost Model.

Unit 2: Program and Network Properties: (8)

Condition of parallelism: Data and Resource, hardware and software parallelism, Program partitioning and scheduling: Grain size and latency, Grain packing and scheduling. Program flow mechanism: control flow Vs data flow, demand driven mechanisms, comparison of mechanisms. System interconnection architecture: Need of Interconnection Network, Static and Dynamic Interconnection network, Omega, Parallel Shifter

Unit 3: Instruction-Level-Parallel Processors: (8)

Dependencies between instructions. Principles of Pipelining. Pipelined instruction processing. Synchronous & asynchronous pipeline. Linear Pipeline-clocking & timing control, speedup, efficiency & throughput. Non linear pipeline- reservation table, latency analysis, collision free scheduling, internal data forwarding.

Unit 4: Parallel Programming Techniques (8)

Parallel programming model: shared-variable model, message passing model, object oriented model and functional and logic model. Code optimization, loop parallelization.

Unit 5: Parallel Program Development and Environment: (6)

Parallel programming environment, synchronization and multiprocessing modes, shared variable program structures, message passing program development, mapping programs onto multicomputers.

Text Books :

1.Hwang Kai," Advance Computer Architecture", TMG

Reference Books :

1. Quinn,"Parallel Computing", TMH
2. Sashi Kumar,"Introduction to Parallel Processing" , PHI
3. Wilkinson,"Parallel Programming", Pearson
4. Rajaraman,"Elements of Parallel Computing", PHI
5. Jordan, "Fundamentals of Parallel Processing", PHI

DEPARTMENTAL ELECTIVE-8 (General) [Option 2]
INT 012: Digital Image Processing

L T P : 4-1-0 **Credit : 4**

UNIT 1: Introduction and Fundamentals **(8)**
Motivation and Perspective, Applications, Components of Image Processing System, Element of Visual Perception, A Simple Image Model, Sampling and Quantization.

UNIT 2: Image Enhancement in Spatial Domain **(8)**
Introduction, Basic Gray Level Functions – Piecewise-Linear Transformation Functions, Contrast Stretching; Histogram Specification, Histogram Equalization, Local Enhancement, Enhancement using Arithmetic/Logic Operations , Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing - Mean filter, Ordered Statistic Filter, Sharpening – The Laplacian.

UNIT 3: Image Enhancement in Frequency Domain **(8)**
Fourier Transform and the Frequency Domain, Basis of Filtering in Frequency Domain, Filters – Low-pass, High-pass, Correspondence Between Filtering in Spatial and Frequency Domain, Smoothing Frequency Domain Filters – Gaussian Lowpass Filters, Sharpening Frequency Domain Filters – Gaussian Highpass Filters, Homomorphic Filtering.

UNIT 4: Image Restoration **(8)**
A Model of Restoration Process, Noise Models, Restoration in the presence of Noise only-Spatial Filtering , Mean Filters: Arithmetic Mean filter, Geometric Mean Filter, Order Statistic Filters – Median Filter, Max and Min filters; Periodic Noise Reduction by Frequency Domain Filtering – Bandpass Filters, Minimum Mean-square Error, Restoration.

UNIT 5: Color Image Processing **(8)**
Color Fundamentals, Color Models, Converting Colors to different models, Color Transformation, Smoothing and Sharpening, Color Segmentation, Morphological Image Processing: Introduction, Logic Operations involving Binary Images, Dilation and Erosion, Opening and Closing, Morphological Algorithms – Boundary Extraction, Region Filling, Extraction of Connected Components, Convex Hull, Thinning, Thickening.

Text Books:
1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.

Reference Books:
1. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY.
2. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.

DEPARTMENTAL ELECTIVE-8 (General) [Option 3]
INT 013: Cloud Computing – Services & Applications

L T P : 4-1-0 **Credit : 4**

Unit 1: Introduction to Cloud Computing **(8)**
Introduction to distributed systems and cloud computing, Cloud architectures: SaaS, PaaS, IaaS, End-to-end system design, Networks and protocol stacks.

Unit-2 : Remote Procedure Call : **(8)**
Client-server computing, Sockets and remote procedure call, RMI, CORBA, Distributed file systems and cache consistency, NFS, AFS, Storage in the Cloud: Google file system.

Unit-3 : Clod Services **(8)**
Web services and REST, Example: Amazon S3, The JAX-RS API, Persistent cloud service, Three-tier middleware, JEE APIs. Google App Engine, Contexts and dependency injection.

Unit-4 : Sockets **(8)**
Message queues and message brokers, JMS and Atmosphere, Web sockets, Distributed snapshots.

Unit-5 : Applications **(8)**
Batch cloud computing: MapReduce and Hadoop, Applications in NoSQL data stores, Peer-to-peer systems. Distributed hash tables, Applications in multiplayer game-playing, Hadoop & Map Reduce – Applications to scientific data Maining, Popular Cloud Computing Systems from Google, Microsoft & IBM.

Text Book :
Dominic Duggan , Enterprise Software Architecture and Design.

Note :

DEPARTMENTAL ELECTIVE : 1 to 8 of Software Engineering & Networking Streams :

IT Department uses the same syllabus which has been approved by CSE Department.

OPEN ELECTIVE – 1
OEL028: COMPUTER & SOCIETY

L T P : 4-1-0 **Credit : 4**

UNIT 1: Introduction **(6)**
Overview SOPA, PIPA

UNIT 2: Privacy issues **(10)**
Consumer data, Internet, Government, Surveillance, Protecting Privacy: Technology, Laws, Regulations, Philosophical Views, Policies, Freedom of speech, Internet censorship/control, International issues.

UNIT 3: Intellectual Property **(8)**
Copyright Law; Music, Movies; Solutions, Computer Crime: Hacking, Online Scams, Computers &Democracy, Computers and Work.

UNIT 4: Social Impact **(8)**
Social impact of Computing Technology, Access, Loss of Skills, Can we trust computers?

UNIT 5: Professional Ethics **(8)**
Computer Failures, Risks, Computer Models, Professional Ethics and Responsibilities.

Text Book :
1. Gift of Fire 3rd ed., S. Baase, Prentice-Hall, 2008.

OPEN ELECTIVE – 2
OEL 008: E-COMMMERCE

L T P : 4-1-0 **Credit : 4**

UNIT 1: Introduction **(6)**
Electronic commerce and Physical Commerce, Different type of e-commerce, Some e-commerce scenario, Advantages of e-commerce

UNIT 2: Technologies of Ecommerce **(8)**
Client side Programming, Server Side Programming, Database connectivity, session tracking techniques, Mobile Agent, WAP, XML, Data Mining, Rich Internet Application, Web 2.0, REST Web Services, Web Mashup, Working of Search Engines, Internet Security.

UNIT 3: Internet Payment System & Strategies **(8)**
Characteristics of payment system, SET Protocol for credit card payment, E-cash, E-check, Micropayment system, Strategies for marketing, Sales and Promotions, Strategies for Purchasing and support activities, Strategies for Web Auctions, Virtual Communities, and web portals

UNIT 4: E-Business & Strategies **(10)**
Introduction, E-Business vs E-commerce, Characteristics of e-Business, e-Business role and their challenges, e-business Requirements, impacts of e-business, Strategic positioning, Levels of e-business strategies, Strategic planning process, Strategic alignment, the consequences of e-Business, Success factors for implementation of e-business strategies. Business models, Business process and collaborations

UNIT 5: Integration of Application **(8)**
Approaches to Middleware, RPC and RMI, Enterprise, Application Integration, e-business Integration, loosely Coupled e-Business solutions for integration, Service Oriented Architecture, EAI and web Services, WS-security, E-commerce Infrastructure Cluster of Servers, Virtualization Techniques, Cloud computing, Server consolidation using cloud, Introduction to Hadoop, HDFS, Google Apps engine

Text Books :

1. E-Commerce Fundamentals and application (Henry Chan) Wiley publication
2. E-Business Organizational and technical foundation (Michael P) Wiley Publication

Reference Books :

1. E- Commerce Strategies, Technology and applications (David) Tata McGrawHill
2. Introduction to E-commerce (Jeffrey) Tata- Mcgrawhill
4. Using Google Aps engine (Severance) O'reilly
5. Hadoop : The Definitive Guide (White) O'reilly

OPEN ELECTIVE – 3
OEL 009: CYBER LAWS

UNIT 1: Introduction to Cyber World and Cyber Law (8)

Cyber World: An Overview - The internet and online resources, Security of information, Digital signature, Cyber space, Regulation of cyber space – introducing cyber law, Scope of Cyber laws e-commerce, online contracts; IPRs (copyright, trademarks and software patenting); e-taxation; e-governance and cyber crimes, Cyber law in India with special reference to Information Technology Act, 2000 .

UNIT 2: Regulatory Framework (10)

A. International Legal Regime - International legal regime relating to Cyber Crimes, European Convention on Cyber Crimes, Hague Convention on Jurisdiction and Foreign Judgments.

B. International legal regime relating to E-Commerce : UNCITRAL Model Law on Electronics Commerce 1996 International legal regime relating to Intellectual Property Rights – Berne Convention, Rome Convention, WIPO Copyright Treaty, WIPO Performance and Phonograms Treaty, UDRP, OECD convention on Database protection

C. Domestic Legal Regime – Cyber Law in India, Information Technology Act, 2000 – Digital Signature; E-Governance; Regulation of Certifying Authorities; Duties of Subscribers; Penalties and Adjudications; Offences under the Act, Making of Rules and Regulations.

UNIT 3: Cyber Crimes (8)

Introduction – Computer crime and cyber crimes; Classification of cyber crimes, Cyber crime and Related Concepts, Distinction between cyber crime and conventional crimes, Reasons for commission of cyber crime, Cyber forensic, Cyber criminals and their objectives, Kinds of cyber crimes – cyber stalking, cyber pornography, forgery and fraud, crime related to IPRs, Cyber terrorism; computer vandalism etc.

UNIT 4: E-Commerce (8)

Online business, Definition of E-commerce, Types of E-commerce, Important Issues in Global E-Commerce, Issues relating to Access (to infrastructure; to contents; universal access; Digital Divide and Universal Divide); Trust, Privacy, Security, Consumer Protection, Content Regulation, Uniformity in Legal Standards pertaining to internet.

UNIT 5: IPR (6)

Overview, Copyright Issues in Cyberspace - Linking, Inlining, Framing, Protection of content on web Site, Inernational Treaties, Trademark Issues in cyberspace - Domain Name Dispute, Cyber squatting, Uniform Dispute Resolution Policy, Meta-tags and Key words, Computer Software and Related IPR Issues.

Text Books:

1. Jonathan L. Zittrain, Internet Law: Jurisdiction (Foundation Press, 2005)
2. Jonathan L. Zittrain, Internet Law: Technological Complements to Copyright (Foundation Press, 2005).

B.Tech.

in

Mechanical Engineering

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2009-10)

Department of Mechanical and Automobile Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Mechanical and Automobile Engineering
School:	School of Engineering and Technology
Name of the Course:	B.Tech. in Mechanical Engineering
Duration:	Four (04) years
Total Number of Credits:	54 (Final Year)
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. G. P. Sinha, HOD, ME&AE, Chairman 2. Prof. D.V. Singh, Fmr. Dir., IIT-R, Ext. Member 3. Prof. S. Prasad, Advisor, GLA Bajaj, Special Invitee 4. Prof. P.K. Sinha, Prof. Emer., ME&AE, Int. Member 5. Prof. R.C. Sachdeva, Dist. ME&AE, Int. Member 6. Prof. Y.V. Satya Kumar, ME&AE, Int. Member 7. Prof. Subhash Kamal, ME&AE, Int. Member 8. Dr. A. Singh, Assoc. Prof., ME&AE, Int. Member 9. Mr. Manish Kr. Yadav, Asst. Prof., Int. Member 10. Mr. Umesh Kr. Jha, Asst. Prof, Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by the BOS and Faculty Board

COURSE STRUCTURE

B.Tech. in Mechanical Engineering (ongoing from the Academic Year 2009-10)

SEMESTER	Courses (L-T-P)										L. Courses	Contact Hr/Week				Credits
												L	T	P	Total	
VII	Professional Competence Development Programme (4-0-0) 4	Department Elective V (4-0-0)4	Design of Mechanical Systems (3-1-0) 4	Refrigerat-ion and Air Condition-ing (3-1-0) 4	Department Elective VI (4-0-0) 4	Open Elective II (4-0-0) 4	Refrigeration and Air Conditioning Lab (0-0-2) 2	Design of Mechanical Systems Lab (0-0-2) 2	Seminar (0-0-0) for 4 Credits		**6**	**22**	**2**	**4**	**28**	**30**
VIII	Project Risk Management (4-0-0) 4	Department Elective VII (4-0-0) 4	Department Elective VIII (4-0-0) 4	Open Elective III (4-0-0) 4	Project (0-0-0) for 8 Credits						**4**	**16**			**16**	**24**

Note: 1) Industrial Training is for 12 Credits. 2) No of Contact Hours for Seminar & Project, will be decided/notified by Dept. **Total Credits: 54**
3) In the Tabulation above, for each subject, above (L-T-P) X, X refers to the no of contact hours for each subject

COURSE STRUCTURE

B.Tech. in Mechanical Engineering (VIIth and VIIIth Term)

Level IV/Term VII

S. No.	SUBJECT CODE	TITLE OF PAPER	HOURS				CREDITS
	THEORY		L	T	P	TOTAL	
1	HMM/PCM	Professional Competence Development Programme	4	-	-	4	4
2	MEC	Design of Mechanical Systems	3	1	-	4	4
3	MEC	Refrigeration & Air Conditioning	3	1	-	4	4
4	MEC	Department Elective V	4	-	-	4	4
5	MEC	Department Elective VI	4	-	-	4	4
6		Open Elective II	4	-	-	4	4
PRACTICAL							
1	MEC	Design of Mechanical Systems Lab	-	-	2	2	1
2	MEC	Refrigeration & Air Conditioning Lab	-	-	2	2	1
3	MEC	Seminar	-	-	-	-	4
TOTAL			**22**	**2**	**4**	**28**	**30**

Level IV/Term VIII

S. No.	SUBJECT CODE	TITLE OF PAPER	HOURS				CREDITS
	THEORY		L	T	P	TOTAL	
1	HMM	Project Risk Management	4	-	-	4	4
2	MEC	Department Elective VII	4	-	-	4	4
3	MEC	Department Elective VIII	4	-	-	4	4
4		Open Elective III	4	-	-	4	4
PRACTICAL							
1	MEC	Project	-	-	-	-	8
TOTAL			**16**	**-**	**-**	**16**	**24**

Contact Hours:
L- Lecture
T- Tutorial
P- Practical

B.Tech.

in

Mechanical Engineering

(with effect from academic session 2009-10)

SYLLABI

Department

Core Subjects

REFRIGERATION & AIR-CONDITIONING

L T P: 3 1 2 **Credits: 5**

UNIT-1: **(8)**

Refrigeration: Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle: Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

UNIT-2: **(8)**

Vapour Compression System: Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system
requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

UNIT-3: **(8)**

Vapour Absorption system: Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram, Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison.

Refrigerants: Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants.

UNIT-4: **(8)**

Air Conditioning: Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP).

UNIT-5: **(8)**

Refrigeration Equipment & Application: Elementary knowledge of refrigeration & air conditioning equipments e.g compressors, condensers, evaporators & expansion devices, Air washers, Cooling, towers & humidifying efficiency, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

Textbooks and References:

1. Refrigeration and Air conditioning, Manohar Prasad, New Age International (P) Ltd. Pub.
2. Refrigeration and Air conditioning, C.P Arora.
3. Refrigeration and Air conditioning, Arora & Domkundwar.
4. Refrigeration and Air conditioning, Stoecker & Jones.
5. Refrigeration and Air conditioning, Roy J. Dossat.
6. Refrigeration and Air Conditioning, P.L. Baloney.

DESIGN OF MECHANICAL SYSTEMS

L T P: 3 1 2 **Credits: 5**

UNIT-1: **(8)**

Engineering Process and Systems Approach: Basic concepts of systems, attributes characterizing a system, system types. Application of systems concepts in Engineering, advantages of systems approach, basic problems concerning systems. Concurrent Engineering.

Problem Formulation: Nature of engineering problems, Needs statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraints. A case Study: e.g. heating duct insulation – system high- speed belt drive system.

UNIT-2: **(8)**

System Theories: System analysis, Black Box approach, state theory approach, component integration approach, Decision process approach; A case study: e.g. automobile Instrumentation panel system.

System Modeling: Need of modeling, Model types and purpose, linear systems, mathematical modeling, Concepts; A case study: e.g. A compound bar system.

UNIT-3: **(7)**

Graph Modeling and Analysis: Graph Modeling and analysis process, path problem, Network flow problem, A case study: e.g. material handling system.

Optimization Concepts: Optimization process, selection of goals and objectives- Criteria, methods of optimization analytical, combinational, subjective. A case study: e.g. aluminium extrusion ion system.

UNIT-4: **(8)**

System Evaluation: Feasibility assessment, planning horizon, time value of money, financial analysis. A case study: e.g. manufacture of a Maize-Starch system.

Optimum Design & Mechanical Systems: Need for Optimization, Detail Design Optimization, Optimum Selection of Configuration, materials & Processes.

UNIT-5: **(9)**

Decision Analysis: Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict Probability density function, Expected monetary value, utility value, Baye's theorem: A case study: e.g. Installation of a Machinery.

System Simulation: Simulation concepts, simulation models, computer applications in simulation, spread sheet simulation. Simulation process, problem definition, input model construction and solution, limitations of simulation approach. A case study: e.g. An inventory control in a Production – Plant.

Textbooks and References:

1. Design And Planning of Engineering Systems, D.D.Reredith, K.V.Wong, R.W.Woodhead, and R.R.Worthman, Prentice Hall Inc., Englewood Cliffs, New Jersey.
2. Design Engineering, J.R.Dixon, Tata Mc Graw Hill Publishing Company, New Delhi.
3. An Introduction to Engineering Design Method, V.Gupta and P.N. Murthy, Tata Mc. Graw Hill.
4. Engineering Design, Robert Matousck, Blackie and Son Ltd., Glasgow.
5. Optimisation Techniques, S.S.Rao.
6. System Analysis and Project Management, Devid I. Cleland, William R.King, Mc Graw Hill.

Department Electives

Pl Note: The list of Subjects categorized under Groups of Department Elective-I, II, III, IV, V, VI, VII and VIII is a general categorization. A student can opt for any eight Department Electives chosen from any eight Groups as per his/her choice and aptitude.

PRESSURE VESSEL DESIGN

L T P: 4-0-0 **Credits: 4**

UNIT 1: Cylindrical Shell and Various Closures (10)

Membrane theory for thin shells, stresses in cylindrical, spherical and conical shells, dilation of above shells, general theory of membrane stresses in vessel under internal pressure and its application to ellipsoidal and torispherical end closures. Bending of circular plates and determination of stresses in simply supported and clamped circular plate. Introduction to ASME code and formulae

UNIT 2: Junction Stresses, Opening and Reinforcements (10)

Discontinuity stresses. Stress concentration in plate having circular hole due to bi-axial loading. Theory of reinforced opening and reinforcement limits.

UNIT 3: Support Design (10)

Supports for vertical & horizontal vessels. Design of base plate and support lugs. Types of anchor bolt, its material and allowable stresses. Design of saddle supports.

UNIT 4: Buckling in Vessels (10)

Buckling of vessels under external pressure. Elastic buckling of long cylinders, buckling modes, Collapse under external pressure. Design for stiffening rings. Buckling under combined external pressure and axial loading.

UNIT 5: Piping Stress Analysis (10)

Flow diagram, Piping layout and piping stress analysis. Flexibility factor and stress intensification factor. Design of piping system as per B31.1 piping code. Piping components – bends, tees, bellows and valves. Types of piping supports and their behavior.

Textbooks:

1. Harvey J F, “Pressure vessel design” CBS publication.
2. Brownell. L. E & Young. E. D, “Process equipment design”, Wiley Eastern Ltd., India.

Reference Books:

1. ASME Pressure Vessel and Boiler code, Section VIII Div 1 & 2, 2003
2. Henry H Bednar, Pressure vessel Design Hand book,CBS publishers and distributors
3. Stanley M Wales, Chemical Process equipment, selection and design, Butterworth’s, series in Chemical Engineering, 1988
4. William.j., Bees,"Approximate methods in the Design and Analysis of pressure vessels and piping", ASME Pressure vessels and piping conference, 1997

INDUSTRIAL TRIBOLOGY

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**
Introduction: Definition and Scope of tribology, Contact of solids, Surface topology, Surface interaction.

UNIT-2: **(10)**
Friction: Definitions, Types, Friction laws, Modern theory of dry solid friction, Temperature of sliding surface, Mechanism of rolling friction, Friction instability, Friction of elastomers.

UNIT-3: **(10)**
Wear: Definition, Classification, Theories of adhesives, Abrasives, Surface fatigue and corrosive wear, Miscellaneous wear theory such as Erosive, cavitations and Fretting wear, Wear of miscellaneous machine components such as gears, Plane bearings and rolling elements.

UNIT-4: **(10)**
Lubrication: Lubrication of bearing, Lubricant, Mineral Oil, Grease, Solid lubricant, Lubrication regime, Viscous flow, Reynolds equation and its limitations, Hydrodynamic lubrication, Hydrostatic lubrication, Elastic-hydrodynamic lubrication, Boundary lubrication, Squeeze films.

UNIT-5: **(10)**
Applications: Application of tribology in manufacturing processes, Metal machining, Metal cutting, Tool wear, Action of lubricants, Friction welding, Extrusion process.

Text Books:
1. " Engineering Tribology" P Sahoo, Prentice Hall of India.
2. "Principles and Applications of Tribology" D.F. Moore Pergamon Press.

Reference Book:
1. "Fundamentals of Tribology," Basu, Sengupta & Ahuja, Prentice Hall of India

INDUSTRIAL DESIGN & ERGONOMICS

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction to Ergonomics and Industrial Design: An approach to industrial design- elements of design, Structure for industrial design in engineering; Application in modern manufacturing systems; General approach to the man-machine relationship, Work station design, Working position.

UNIT-2: **(10)**

Control and Displays: Shapes and sizes of various controls and displays- Multiple displays and control situations; design of major controls in automobiles, machine tools etc.; Design of furniture; Redesign of instruments.

UNIT-3: **(10)**

Ergonomics and Production: Ergonomics and product design, ergonomics in automated systems; Expert systems for ergonomic design; Anthropometrics data and its applications in ergonomic design; Limitations of anthropometric data, Use of Computerized database; Case study.

UNIT-4: **(10)**

Visual Effects of Line and Colour: The Mechanics of seeing; Psychology of seeing; General influence of line and form; Colour and light; Colour and objects; Colour and the eye; Colour consistency; Colour terms; Reaction to colour and colour continuation; Colour on engineering equipments.

UNIT-5: **(10)**

Aesthetic Concepts: Concept of unity; Concept of order with variety; Concept of purpose style and environment, Aesthetic expressions; Style, Components of style; House style; Observation style in capital goods; Case study. Industrial Design in Practice: General design; Specifying Design equipments; Rating the importance of industrial design; Industrial design in design process.

Textbooks and References:

1. Industrial design for Engineers, W.H. Mayall London Hiffee Books Ltd.
2. Introduction to Ergonomics, R.C. Bridger McGraw Hill.

INDUSTRIAL PRODUCT DESIGN

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction: Approach to industrial design. Approach to industrial product based on idea generation and innovativeness to meet the needs of the developing society. Design and development process of industrial products, various steps such as creative process involved in idea of marketing, mind criticism, design process, creation. Ergonomics and aesthetics requirement of product design, quality and maintainability consideration in product design. Use of modeling technique, prototype design, conceptual design.

UNIT-2: **(10)**

Industrial Product Design: General Design situations, setting specifications, requirements and ratings, their importance in design. Study of market requirements and manufacturing aspects of industrial design. Aspects of ergonomics design of machine tools, testing equipments, instruments, automobiles, process equipments, conventions of style, form & color in industrial design.

UNIT-3: **(10)**

Design of consumer product: Design concepts of consumer product, specification requirements and ratings of their importance in design, functions and use, standard and legal requirements, body/dimensions Ergonomic considerations, interpretation of information, conventions for style, forms, colors.

UNIT-4: **(10)**

Aesthetics concept: Concept of unity and order with variety, concept of purpose, style and environment, aesthetic expressions of symmetry, balance, contrast, continuity, proportion, rhythm, radiance. Form and style of product, visual effect of line and form, mechanics of seeing, psychology of seeing, influence of line and form, component of style, basic factor, house style, effect of color on product appearance, color composition, conversion of colors of engineering products.

UNIT-5: **(10)**

Economic considerations: Selection of materials, design for production, use of standardization, value analysis and cost reduction, maintenance aspect of product design

Design organization: Organization structure, design position, drawing office procedure, standardization, record keeping, legal product of design patents.

Text Books:

1. The generation of Idea for new products, Trevor Sowecy, Kogan Page
2. Engineering Design conceptual stage, M. J. French, Heinman Education Books.

Reference Books:

1. Industrial Design for Engineers, W.H. Mayall, London Ilifle Books Ltd.
2. Problems of product Design and development, Hearn Buck, Pergamon Press.
3. Industrial Designs in Engineering, Cherles H. Flurscheirm, Design Council

OPTIMIZATION METHODS IN ENGINEERING DESIGN

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction: Historical Developments, Engineering applications of Optimization Classical Optimization Techniques: Introduction, Review of single and multivariable optimization methods with and without constraints, Non-linear one-dimensional minimization problems, Examples.

UNIT-2: **(10)**

Constrained Optimization Techniques: Introduction, Direct methods - Cutting plane method and Method of Feasible directions, Indirect methods - Convex programming problems, Exterior penalty function method, Examples and problems Unconstrained

UNIT-3: **(10)**

Optimization Techniques: Introduction, Direct search method - Random, Univariate and Pattern search methods, Rosenbrock's method of rotating co-ordinates, Descent methods, Steepest Decent methods-Quasi-Newton's and Variable metric method, Examples.

UNIT-4: **(10)**

Geometric Programming: Introduction, Unconstrained minimization problems, solution of unconstrained problem from arithmetic-geometric inequality point of view, Constrained minimization problems, Generalized polynomial optimization, Applications of geometric problems, Introduction to stochastic optimization.

UNIT-5: **(10)**

Novel methods for Optimization: Introduction to simulated annealing, selection of simulated annealing parameters, simulated annealing algorithm; Genetic Algorithm (GA), Design of GA, Key concepts of GA, Neural Networks, A frame work for Neural Network models, Construction of Neural Network algorithm, Examples of simulated algorithm, genetic annealing and Neural Network method.

TEXT BOOKS:

1. Engineering Optimization S. S. Rao New Age International
2. Applied Optimal Design E. J. Haug and J.S. Arora Wiley, New York

REFERENCE BOOK:

1. Optimization for Engineering Design, Kalyanmoy Deb Prentice Hall of India
2. Optimization G.V. Reklaites, A. Ravindran and K.M. Rogsdeth Wiley, New York

INDUSTRIAL ENGINEERING AND MANAGEMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Productivity: Introduction, definition, measurement, productivity index, ways to improve productivity, Types of Production System.

Work study: Meaning and benefits of work study, time & motion study. Micromotion study P.M.T.S. man machine Diagram flow chart. Motion economy, Method study, work measurement, and work sampling, standard time.

UNIT-2: **(10)**

Plant layout and materials Handling: Plant location, type of layout, principles of facility layout principles of material handling, Material Handling equipments.

Production planning and control: Objectives, Forecasting, product design and development functions, steps in PPC. Planning routine, scheduling, Dispatching & follow-up, Effectiveness of PPC, Introduction of JIT.

UNIT-3: **(10)**

Managerial Economics: Introduction, Assumptions, Time Value of money, apprised, criteria step-in BEA, purpose, costs & overheads fixed & variable costs, margin of safety, Angle of incidence profit volume graph.

Replacement Analysis: Depreciation causes, obsolescence, service life of assets, Replacement of items.

Maintenance Management: Maintenance Planning & Control, Maintenance Strategy

UNIT-4: **(10)**

Inventory Control: Inventory, function, cost, deterministic models, Introduction to MRP, supply chain Management

Quality Control: Introduction, process control, SQC control Charts, Single double & sequential sampling, Introduction to TQM & bench marking.

UNIT-5: **(10)**

Supply Chain Management and Decision Support System: MRP, ERP, Modern Supply Chain

Manpower Planning: Resources, Human relationship.

Job Evaluation & Merit rating: Job analysis, Job description job simplification and job evaluation methods & description, merit rating, wage incentive plans.

Textbooks:

1. Principles of Management. An analysis of Management Functions, H.Koontz & C.O. Donnel. Tata McGraw-Hall Co.

Reference Books:

1. Manufacturing Management, J Moore Prentice Hall, Englewood Cliffs New Jersey.
2. Modern Production Operations Management, Buffa E.S. Wiley Eastern.

RISK MANAGEMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction to Risk Management: What risk is all about; Basic Purpose of Risk Management in Banks; The process of Risk Management; Different Types of Risks in Banks; Overview of Enterprise-wide Risk Management in Banks; Asset-Liability Management in Banks: Need for macro- and Micro-level Asset-Liability Management; Role of Asset-Liability Management Committee; The Asset-Liability Management process; Asset-Liability Management and its Purpose; Regulatory prescription for Asset-Liability Management.

UNIT-2: **(10)**

Managing Credit Risk: Drivers of Credit Risk; Credit Rating; Capital Adequacy Requirements; BIS Risk-Based Capital Requirements Frame Work; Traditional Measurement Approaches; Different Models of Credit Risk Managing Market Risk in Banks: Risk and Sources of Risk; Measuring Risk and Value-at-Risk (VaR); Approach to VaR; Basel Committee Recommendations; Types of Risk; Indian Scenario.

UNIT-3: **(10)**

Managing Liquidity Risk: Liquidity Risk and the Need for Managing it in the Long/short Run; Fundamental Approach to Long Run Liquidity Risk Management; Technical Approach to short Run Liquidity Risk Management; Factors Influencing Investment- Borrowing Decisions. Managing Interest Rate Risk: Types of Interest rate risks; Gap Methodology; Duration Analysis. Managing Foreign Exchange Risk: Nature and Magnitude of Exchange risk; Tools and Techniques for Managing Forex Risk; Managing the currency risk; Futures, options and swaps.

UNIT-4: **(10)**

Operational Risk Management: Operational Risk and Its Evolution; Major Sources of Operational Risk; Measurement of Operational Risk; Management of Operational Risk, Risk Management Frame work in Banks: Enterprise –wide Risk Management in Banks; Elements of Risk Management Frame work; Systematic Risk Management in Banks; Different Measures of measuring Risks; Involvement of the management in the Risk Management Frame work, Risk Management Tools: Tools and Techniques for Managing Credit Risk, Forex Risk, Interest Rate Risk, Market Risk

UNIT-5: **(10)**

Derivatives in Banks: Futures in Banks and Different Types of Futures; Options in Banks and Different Types of Options; Swaps in Banks and Different Types of swaps; Use of the Derivative Products. Risk Management Strategies: Operational Risk Management Strategies; Financial Risk Management Strategies; Systematic Risk Management Strategies; Risk Limitation; IT Implementation Challenges. Enterprise-Wide Risk Management in Banks: The Necessity of ERM; The Process of ERM; Measurement of ERM; Transfer Pricing; Cases in ERM The New Basel Accord- Implication for Banks: Basel II Frame Work- The Three Pillar Architecture; Organizations Affected by Basel II; Impact of Basel II.

Text Books:

1. Risk Management Michel Crouchy and others; McGraw-Hill
2. Risk Management in Banks Joel Besis, John Wiley and Sons

Reference Books:

1. Financial Risk Management Edinburgh Business School
2. Risk Management S B Verma, Deep & Deep Publications
3. Managing Bank Risk Morton Glantz – Published by Academic Press
4. Asset Liability Management T Ravi Kumar- ICFAI Vision Series

PRODUCTION MANAGEMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction: Definition, scope and objectives of Production Management, Relationship of production with other management functions, Interdepartmental relationship,
Production operation strategies

UNIT-2: **(10)**

New Product Design: Need, characteristics of phases of product life cycle, Product characteristics analysis, Market, functional, operational, quality, reliability, ergonomics, Economic consideration, FMECA, QFD

UNIT-3: **(10)**

Production Function: Process design frame work, Work station, Line balancing, Different techniques, Batch Production, Minimum cost, Maximum profit, Production range, Process planning - Factors, steps, Selection of technology, Selection of equipment, Flow design

UNIT-4: **(10)**

Applications: Application of Quantitative techniques for production decision Simulation, Sequencing, Queuing
Capacity Planning: Definition and basic concepts, Long term and short term capacity strategies, Aggregate planning - strategies and guidelines, LP approach to aggregate planning, MPS
Plant Maintenance: Principles, need, policies and objectives, Types of maintenance, Reliability and life testing, TPM.

UNIT-5: **(10)**

Capital Investment Decisions: Concept, Types, Concept of time value of money, Evaluation techniques. Replacement Analysis – Concept, Types, Evaluation Techniques
Project Management: Project identification and formulation, Market, Technical economic and financial feasibility, Project scheduling and monitoring – CPM and PERT techniques, PMIS, Project Quality Assurance

Text Books:

1. Adam EE, RJ Ebert, Production and operation management- Prentice Hall Englewood Cliff, N.J.
2. Riggs. J L - Production system, Planning, Analysis and Control – John Weily and sons, New York.

Reference Books:

1. James Dilworth, Production and Operation Management- McGraw Hill Book Company, N. York.
2. Martand Telsang, Industrial Engineering and Production Management- S Chand & Co, New Delhi.
3. Prasanna Chandra, Project Appraisals Buffa. E.S, Modern production and Operation Management- Willey, New Delhi.
4. Barry Shore- Operation Management- McGraw Hill Book Company, New York.
5. Joseph Monks, Operation Management, Theory and Problems, McGraw Hill Book Company, New York.

DISASTER MANAGEMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Environmental Hazards & Disasters, Meaning of Environmental hazards, Environmental Disasters and Environmental stress, Concept of Environmental Hazards, Environmental stress & Environmental Disasters., Different approaches & relation with human Ecology, Landscape Approach, Ecosystem Approach, Perception approach, Human ecology & its application in geographical researches.

UNIT–2: **(10)**

Types of Environmental hazards & Disasters, Natural hazards and Disasters, Man induced hazards & Disasters, Natural Hazards- a.1 Planetary Hazards/ Disasters 2 Extra Planetary Hazards/ disasters, Planetary Hazards, Endogenous Hazards, Exogenous Hazards, Endogenous Hazards, Volcanic Eruption, Earthquakes, Landslides Volcanic Hazards/ Disasters, Causes and distribution of Volcanoes, Hazardous effects of volcanic eruptions, Environmental impacts of volcanic eruptions, Earthquake Hazards/ disasters, Causes of Earthquakes, Distribution of earthquakes, Hazardous effects of earthquakes, Earthquake Hazards in India, Human adjustment, perception & mitigation of earthquake., Cyclones, Flood control measures, Droughts, Soil Erosion, Chemical hazards/ disasters, Biological hazards/ disasters

UNIT-3: **(10)**

Emerging approaches in Disaster Management- Three Stages, Pre- disaster stage (preparedness), Preparing hazard zonation maps, Predictability/ forecasting & warning, Preparing disaster preparedness plan, Land use zoning, Preparedness through (IEC) Information, education & Communication Pre-disaster stage (mitigation), Disaster resistant house construction, Population reduction in vulnerable areas, Awareness, Emergency Stage, Rescue training for search & operation at national & regional level, Immediate relief, Assessment surveys, Post Disaster stage-Rehabilitation, Political Administrative Aspect, Social Aspect, Economic Aspect, Environmental Aspect

UNIT–4: **(10)**

Natural Disaster Reduction & Management, Provision of Immediate relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards

UNIT-5: **(10)**

Disaster Management- An integrated approach for disaster preparedness, mitigation & awareness. Mitigation-Institutions- discuss the work of following Institution. Meteorological observatory, Seismological observatory, Volcanology institution, Hydrology Laboratory, Industrial Safety inspectorate, Institution of urban & regional planners, Chambers of Architects, Engineering Council, National Standards Committee Integrated Planning-Contingency management Preparedness, Education on disasters, Community involvement, The adjustment of Human Population to Natural hazards & disasters, Role of Media, Monitoring Management- Discuss the programs of disaster research & mitigation of disaster of following organizations. International Council for Scientific Unions (ICSU)- Scientific committee on problems of the Environment (SCOPE), International Geo-sphere, Biosphere program (IGBP), World federation of Engineering Organizations(WFED), National Academy of Sciences, World Meteorological organizations(WMO), Geographical Information System(GIS), International Association of Seismology & Physics of Earth's Interior (IASPEI)

Textbooks:

1. Kates,B.I & White, G.F The Environment as Hazards, oxford, New York, 1978
2. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000

Reference Books:

1. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi,1990
2. Savinder Singh Environmental Geography, Prayag Pustak Bhawan, 1997
3. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003
4. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo, 1994
5. Dr. Satender , Disaster Management t in Hills, Concept Publishing Co., New Delhi, 2003
6. A.S. Arya Action Plan For Earthquake,Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
7. R.K. Bhandani An overview on Natural & Man made Disaster & their Reduction,CSIR, New Delhi
8. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management,IIPA, New Delhi, 2001

SAFETY MANAGEMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: Concepts and Techniques (10)

History of Safety movement –Evolution of modern safety concept- general concepts of management – planning for safety for optimization of productivity -productivity, quality and safety-line and staff functions for safety-budgeting for safety-safety policy.

Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection, safety sampling, evaluation of performance of supervisors on safety.

UNIT-2: Safety Audit - Introduction (10)

Components of safety audit, types of audit, audit methodology, non conformity reporting (NCR), audit checklist and report – review of inspection, remarks by government agencies, consultants, experts – perusal of accident and safety records, formats – implementation of audit indication - liaison with departments to ensure co-ordination – check list – identification of unsafe acts of workers and unsafe conditions in the shop floor.

UNIT-3: Accident Investigation and Reporting (10)

Concept of an accident, reportable and non reportable accidents, reporting to statutory authorities – principles of accident prevention – accident investigation and analysis – records for accidents, departmental accident reports, documentation of accidents – unsafe act and condition – domino sequence – supervisory role – role of safety committee –cost of accident.

UNIT-4: Safety Performance Monitoring (10)

ANSI (Z16.1) Recommended practices for compiling and measuring work injury experience – permanent total disabilities, permanent partial disabilities, temporary total disabilities - Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety “t” score, safety activity rate – problems.

UNIT-5: Safety Education and Training (10)

Importance of training-identification of training needs-training methods – programmes, seminars, conferences, competitions – method of promoting safe practice - motivation – communication - role of government agencies and private consulting agencies in safety training – creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training.

Text Books:

1. Heinrich H.W. “Industrial Accident Prevention” McGraw-Hill Company, New York, 1980.
2. Krishnan N.V. “Safety Management in Industry” Jaico Publishing House, Bombay, 1997.

Reference Books:

1. Lees, F.P., “Loss Prevention in Process Industries” Butterworth publications, 2nd edition, 1990.
2. John Ridley, “Safety at Work”, Butterworth & Co.” 1983.

OPERATIONS RESEARCH

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction: History and development of OR, Applications, modeling in OR, OR models and their applications.

Linear Programming Problems: Formulation of problem, Graphical solution, Simplex procedure for maximization and minimization, Duality concept.

UNIT-2: **(10)**

Assignment Model: Mathematical statement, Methods to solve balanced and unbalanced assignment Problems, Maximization problems, Assignment with restrictions, Traveling salesman problem.

Replacement & Maintenance analysis: Introduction, types of maintenance, types of replacement problem, determination of economic life of an asset

UNIT-3: **(10)**

Transportation Model: Mathematical formulation, methods to obtain initial basic feasible solution (IBFS), NWCR and VAM, conditions for testing optimality, MODI method for testing optimality solution of balanced and unbalanced problems, Degeneracy and its resolution.

UNIT-4: **(10)**

Decision Theory: Introduction, Pay off table, Opportunity loss or regret table, Decisions under uncertainty, Laplace Criterion, Maximin or minimax principle, maximax or minimax principle, Hurcuilicz principle, Decisions under risk–maximum likelihood criteria, Expectation principle, Expected opportunity loss or expected regret decision trees.

UNIT-5: **(10)**

Queuing Model: Introduction, Kendall's notation, Classification of queuing models, Sequencing of n jobs and 2 & 3 machines, 2 jobs and m machines.

Inventory control: Introduction, models of inventory, operation of inventory system, Quantity discount, fixed order quantity system, periodic quantity system EOQ model.

Text Books:

1. Operations Research, J.K. Sharma, McMillan India Publication. New Delhi
2. Operations Research, Hiza & Gupta, S.Chand & Co. New Delhi

Reference Books:

1. Introduction to Operation Research, Hamdy A. Taha, Prentice Hall India Publication.
2. Production and Operation Management, Tripathy Scitech Publication
3. Engineering Management, Chithambaranathan Scitech Publication
4. Optimisation in Engineering, Biswal, Scitech Publication
5. Operations Research, Manohar Mahajan Dhanapat Rai and Sons

TOTAL QUALITY MANAGEMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction **(10)**

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT-2: TQM Principles **(10)**

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT-3: Statistical Process Control (SPC) \ **(10)**

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT-4: TQM Tools **(10)**

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT-5: Quality Systems **(10)**

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

Text Books

1. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

Reference Books:

1. James R.Evans & William M.Lidsay, “The Management and Control of Quality”, (5th Edition), South-Western (Thomson Learning), 2002
2. Feigenbaum.A.V. “Total Quality Management”, McGraw-Hill, 1991.
3. Oakland.J.S. “Total Quality Management”, Butterworth Hcinemann Ltd., Oxford, 1989.
4. Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”, New Age Intl. 1996.
5. Zeiri. “Total Quality Management for Engineers”, Wood Head Publishers, 1991.

RELIABILITY ENGINEERING

L T P: 4 0 0 **Credits: 4**

UNIT-1: Reliability Engineering (10)

System reliability - series, parallel and mixed configuration, Block diagram, r-out-of-n structure, Solving problems using mathematical models. Reliability improvement and allocation-Difficulty in achieving reliability, Method of improving reliability during design, different techniques available to improve reliability, Optimization, Reliability – Cost trade off, Prediction and analysis.

UNIT-2: Maintainability, Availability & Failure Analysis (10)

Maintainability & Availability – Introduction, formulae, Techniques available to improve maintainability & availability, trade off among reliability, maintainability & availability, simple problems, Defect generation – Types of failures, defects reporting and recording, Defect analysis, Failure analysis, Equipment down time analysis, Breakdown analysis.

UNIT-3: Maintenance Planning and Replacement (10)

Maintenance planning – Overhaul and repair; Meaning and difference, Optimal overhaul/Repair/Replace maintenance policy for equipment subject to breakdown, Replacement decisions – Optimal interval between preventive replacements of equipment subject to breakdown, group replacement.

UNIT-4: Maintenance Systems (10)

Fixed time maintenance, Condition based maintenance, Operate to failure, Opportunity maintenance, design out maintenance, Total productive maintenance, Inspection decision – Optimal inspection frequency, non-destructive inspection, PERT & CPM in maintenance, Concept of terotechnology.

UNIT-5: Condition Monitoring (10)

Techniques-visual monitoring, temperature monitoring, vibration monitoring, lubricant monitoring, Crack monitoring, Thickness monitoring, Noise and sound monitoring, Condition monitoring of hydraulic system, Machine diagnostics - Objectives, Monitoring strategies, Examples of monitoring and diagnosis, Control structure for machine diagnosis. C.B.M, T.P.M. based reliability-improvement Techniques

Text Books:

1. Concepts in Reliability Engineering L.S. Srinath Affiliated East West Press
2. Engineering Maintainability: How to Design for Reliability and Easy Maintenance B.S. Dhillon Prentice Hall of India

Reference Books:

1. Maintainability and Reliability Handbook Editors: Ireson W.A. and C.F.Coombs McGraw Hill Inc.
2. Failure Diagnosis and Performance Monitoring L.F. Pau Marcel Dekker
3. Management of Industrial Maintenance Kelly and M.J. Harris Butterworth and Co.
4. Maintenance, Replacement and Reliability A.K.S. Jardine Pitman Publishing
5. Industrial Maintenance Management S.K. Srivastava S. Chand & Co Ltd.

MATERIALS MANAGEMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction & Materials management functions; Inventory, Inventory types; Tools for materials management; Materials ,Planning and programming-relevant costs, Measurement of costs.

UNIT-2: **(10)**

Static Inventory Models: Static inventory models under uncertainty, decision criteria for inventory problems. Dynamic Inventory Models: Models under certainty; Optimal lot size with constant demand; Dynamic inventory ,problems under risk and under uncertainty;

UNIT-3: **(10)**

Multi-stage inventory problems; Procurement policies under inventories supported with some case studies; Value analysis and standardization in procurement; Materials Requirement Planning (MRP), Inputs, Outputs, MRP computation, EOQ-MRP comparisons; MRP types; Capacity Planning and Control.

UNIT-4: **(10)**

Simulation: Simulation categories; Monte-Carlo simulation; perpetual inventory; Periodic simulation problems; Simulation of joint probability distribution.

UNIT-5: **(10)**

I**nventory Control systems:** Types of control systems; Selective inventory control; Inventory system development, Excess materials; Inventory system improvement; Aggregate inventory measurement.

Text Books:

1. Materials Management: An Integrated Approach P. Gopalakrishnan & M. Sundaresan, PHI
2. Materials Management: Procedures, text and Cases A.K. Datta Prentice Hall of India

Reference Books:

1. Operations Research A.P. Verma S.K. Kataria & Sons
2. Inventory Management D. Chandra Bose Prentice Hall of India
3. Materials Management A.K. Chitale R.C. Gupta Prentice Hall of India

ENTREPRENEURSHIP DEVELOPMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Entrepreneur: Definition, Concept, importance, nature, types, entrepreneurial culture, growth, entrepreneurial traits & motivations.

Entrepreneurship: Theory, Aspects, environment for entrepreneurship, The process of entrepreneurial development training, Barrier to entrepreneurship, Integrated – contextual model for Entrepreneurship.

UNIT-2: **(10)**

Project identification: concept of Project & classification, Searching for business idea, opportunity finding, Project formulation. Project design & net work analysis.

Setting Up of SSI: steps for starting small scale industry, whom to approach for what, incentives and subsidies, Role of state development, finance corporations, noodle agencies, Role of consultancy Organization, Lead Bank, various clearances & certificate required for a particular industry.

UNIT-3: **(10)**

Project Report: Project Report preparation, feasibility report, marketing research, Project appraisal, factory design and Layout, Interviews with Industrialist, case studied.

UNIT-4: **(10)**

Industrial Finance: Financial appraisal, Long term loan, short term loan, over drafts, letter of credit, working capital management.

Costing and Accounting: Direct and Indirect costs, Break-even analysis, Financial projections, statement of cash flow, Balance Sheet, Profit and loss account, accounting ratios, Income tax, Sales Tax(VAT),Excise Tax(CEN VAT)

UNIT-5: **(10)**

Problems to entrepreneurship: SSI – sickness, reasons and remedies, Revival of sick unit, Role of BIFR (rehabilitation schemes)

Text Books:

1. Entrepreneurship Development and Management, Neeta Bopodikar, Himalaya Publishing House, Delhi

Reference Books:

1. Dynamics of Entrepreneurial Development and Management, Vasant Desai, Himalaya Publishing House, Delhi
2. Management of small scale Industries, Vasant Desai; Himalaya Publishing House, Delhi
3. Small Scale Industries and Entrepreneurship, Vasant Desai, Himalaya Publishing House, Delhi

ADVANCED MANUFACTURING PROCESSES

L T P: 4 0 0 **Credits: 4**

UNIT-1: Advanced Machining Processes (14)

Process principle, Material removal mechanism, Parametric analysis and applications of processes such as ultrasonic machining (USM), Abrasive jet machining (AJM), Water jet machining (WJM), Abrasive water jet machining (AWJM), Electrochemical machining (ECM), Electro discharge machining (EDM), Electron beam machining (EBM), Laser beam machining (LBM) processes.

UNIT-2: (12)

Advanced Casting Processes

Metal mould casting, Continuous casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting

UNIT-3: (12)

Advanced Welding Processes

Details of electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW),

UNIT-4: (12)

Advanced Metal Forming Processes

Details of high energy rate forming (HERF) process, Electro-magnetic forming, explosive forming, Electro-hydraulic forming, Stretch forming, Contour roll forming

Text Books:

1. "Nontraditional Manufacturing Processes", G.F. Benedict, Marcel Dekker, Inc. New York.

References Books:

1. "Materials and Processes in Manufacturing" (8th Edition), E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi
2. "Manufacturing Science" A. Ghosh, and A. K. Mallik, Affiliated East-West Press Pvt. Ltd. New Delhi.

NON CONVENTIONAL MACHINING PROCESSES

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction **(10)**

Unconventional Machining Process – Need – classification – Brief overview.

UNIT-2: Mechanical Energy Based Processes **(10)**

Abrasive Jet Machining – Water Jet Machining – Abrasive Water Jet Machining - Ultrasonic Machining. (AJM, WJM, AWJM and USM). Working Principles – equipment used – Process parameters – MRR-Variation in techniques used – Applications.

UNIT-3: Electrical Energy Based Processes **(10)**

Electric Discharge Machining (EDM) - working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications.

UNIT-4: Chemical and Electro-Chemical Energy Based Processes **(10)**

Chemical machining and Electro-Chemical machining (CHM and ECM)- Etchants, Maskant- techniques of applying maskants-Process Parameters – Surface finish and MRR-Applications. Principles of ECM-equipments-Surface Roughness and MRR Electrical circuit-Process Parameters-ECG and ECH - Applications.

UNIT-5: Thermal Energy Based Processes **(10)**

Laser Beam machining and drilling (LBM), plasma arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.

Text Books:

1. Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd., New Delhi, 2007
2. Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi (2007).

Reference Books:

1. Benedict. G.F. “Nontraditional Manufacturing Processes” Marcel Dekker Inc., New York (1987).
3. Paul De Garmo, J.T.Black, and Ronald.A.Kohser, “Material and Processes in Manufacturing” PHI, 8th Edition,2001.

NON-DESTRUCTIVE TESTING

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction **(10)**

Scope and advantages of NDT. Comparison of NDT with DT. Some common NDT methods used since ages, Terminology. Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test chalk test (oil whitening test). Attractive uses of above tests in detecting surface cracks, bond strength & surface defects.

UNIT-2: Common NDT Methods **(10)**

Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrant and developers. Illustrative examples – Heavy castings of large size, frame of jet engine, porosity testing of nickel alloys, leak testing. Zyglo test

Magnetic particle Inspection– Scope, principle, Ferro Magnetic and Non-ferro magnetic materials, equipment & testing. Advantages, limitations Interpretation of results. DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.

UNIT-3: Radiographic Methods **(10)**

X-ray radiography principle, equipment & methodology. Applicability, types of radiations, limitations. Interpretation of Radiographs, limitations of y-ray radiography – principle, equipment. Attenuation of electro magnetic radiations, source of radioactive materials & technique. Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering). Pair production, Beam geometry, Scattering factor. Advantages of y-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study — X-ray of human body.

UNIT-4: Ultrasonic Testing Methods **(10)**

Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study– Ultrasonography of human body.

UNIT-5: Eddy Current Inspection **(10)**

Principle, Methods, Advantages, Scope and limitations. Types of Probes. Case Studies.

Text Books:

1. ASM Handbook Vol. 11,8th Edition – Non-destructive Testing & Evaluation
2. Research Techniques in NDT Vol.3, R.S. Shah, Academic

Reference Books:

1. Bray, Don E. and Stanley, Roderic K., Nondestructive Evaluation: A Tool in Design, Manufacturing, and Service. Revised Edition 1997, CRC Press New York.

SHEET METAL TECHNOLOGY

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(12)**

Introduction: Stress/strain/strain-rate characteristics of materials, Yield criteria, classification of metal working processes, Formability and theory of sheet metal working, Friction and lubrication in metal working operation, Theories of friction and lubrication, Assessment of friction at interface.

UNIT-2: **(18)**

Process Analysis: Various methods of analyzing the metal working processes (slip-line field theory, Upper bound solution, stab methods). Mechanics of Forming Processes: Rolling-Determination of rolling pressure, roll separating force, driving torque and power, Power loss in bearings, Forging-Forces in strip forging and disc forging, Drawing-determination of force and power, Maximum allowable reduction, Deep drawing force analysis, Analysis of tube drawing process with fixed and moving mandrel, Tandem tube drawing, Bending-Determination of work load and spring back, Extrusion-Determination of work load from stress analysis and energy consideration, Power loss, Hydrostatic extrusion, Punching & Blanking-Mode of metal deformation and failure, 2D deformation model and fracture analysis, Determination of work force.

UNIT-3: **(7)**

Hydrostatic Extrusion: Comparison with conventional extrusion, Pressure required for extruding, variables affecting the process.

UNIT-4: **(13)**

High Speed Forming: Classification, Comparison of low and high speed forming, operation problems in high speed forming operation, Introduction to high forming process such as explosive forming, Electrical and Mechanical high speed forming techniques.

Text Books:

1.Technology of Metal Forming Processes S. Kumar Prentice Hall of India

Reference Books:

1. An Introduction to the Principles of Metal Working Rowe Arnold
2. Metal Forming Analysis Avitzur McGraw Hill
3. Mathematical Simulation and Computer analysis of Thin Strip Rolling Mill Polukhin MIR Publications
4. Plasticity for Mechanical Engineers Johnson & Mellore Van Nostrand
5. High Velocity Working of Metals ASTME EEE
6. Manufacturing Science Ghosh & Mallik Affiliated East-West

FLEXIBLE MANUFACTURING SYSTEMS

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction: FMS definition and classification of manufacturing systems, Automated production cycle, Need of flexibility, Concept of flexibility, Types of flexibilities and its measurement. FMS Equipment: Why FMS, Factors responsible for the growth of FMS

UNIT-2: **(10)**

FMS types and applications, Economic justification for FMS, Functional requirements for FMS equipments, FMS processing and QA equipment, e.g., turning and machining centers, Co-ordinate measuring machines, Cleaning and deburring machines, FMS system support equipment, Automated material handling and storage equipment, cutting tool and tool management, Work holding considerations, Fixture considerations in FMS environment.

UNIT-3: **(10)**

Group Technology: GT concepts, Advantages of GT, Part family formation-coding and classification systems; Part-machine group analysis, Methods for cell formation, Use of different algorithms, mathematical programming and graph theoretic model approach for part grouping, Cellular vs FMS production. FMS related problem and Solution Methodology

UNIT-4: **(10)**

FMS design problems: Part assignment, Machine selection, Storage system selection, Selection of pallets and fixtures, Selection of computer hardware and software, designing for layout integration of machine storage, Material handling System and computer system, Communication networks.

UNIT-5: **(10)**

FMS planning problems: Strategic planning, Part type selection, Machine grouping, production ratio and resource allocation, Machine loading problems. Operational & Control problems: Part scheduling, Machines robots & AGVS, Process monitoring & control. FMS Implementation: Objectives, acceptance testing, Performance goals and expectation maintenance concerns.

Text Books:

1. Flexible Manufacturing System, Wernecks, Spring-Verlag

Reference Books:

1. Automation, Production System & Computer Integrated Manufacturing Groover Englewood.
2. Design and Operation of FMS, Rankey, IFS.

NOISE & VIBRATION ANALYSIS AND CONTROL

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction to Vibration: Introduction, Causes and effects of vibration, vibration terminology, Equation of motion- Energy method, Rayleigh's method etc., Harmonic and periodic motions, Vibration standards, Single-DOF Free Vibrations

Multi Degree of Freedom Vibrations: Matrix formulation, eigen values and eigen formulation, matrix iteration techniques – normal modes and orthgonality, transient response of multi degree freedom system, mode superposition technique, torsional oscillations of multirotor systems

UNIT-2: **(10)**

Torsional vibrations: Simple systems with one or two rotor masses Multi-DOF systems-transfer matrix method Geared system Branched system

Vibration Instrumentation: Vibration measurements – Vibration measurement parameters (displacement, velocity & acceleration),instrumentation –electrodynamics exciters – impact hammers, piezoelectric accelerometers, signal conditioning and amplification, filters, preamplifiers and power amplifiers, real time analysis, FFT analysis, structural frequency response measurement, modal testing of beams, Modal parameter (natural frequency, mode shape and damping) estimation techniques

UNIT-3: **(10)**

Vibration analysis: Relevance of vibration analysis, introduction to experimental modal analysis**,** Structural modal analysis, mode shapes, Euler's beam equation for natural frequency, Calculation of natural frequencies - Rayleigh method, Stodala method, machine diagnostics through vibration analysis.

UNIT-4: **(10)**

Noise: Introduction, causes, effects, basic terms, Noise characteristics, Sources of noise, vehicular noise level, engine noise, transmission noise, brake squeal, structural noise, noise in auxiliaries, wind noises, wave equation, noise standards etc.

Noise measurement: Sound and Noise parameters, propagation of sound & noise in various machinery's, noise measuring parameters, noise level measurement techniques, Noise level interpolation and mapping, noise measuring instruments

UNIT-5: **(10)**

Noise Control: Mechanization of noise generation, noise control methodologies, noise control measures, environmental noise management, Road vehicle noise standards, Sound absorption by porous materials, silencer and suppression systems, Sound absorption, sound insulation, acceptance noise levels

Text Books:

1. N. L. Meirovitch, Elements of vibration Analysis, Mc Graw Hill New York, 1986.
2. Mechanical Vibration, Grover G. K., Nem Chand & Brothers, Roorkee

Reference Books:

1. Harris, C. M. Handbook of Acoustical Measurements and Noise Control, Acoustical Society of
2. Beranek L.L. & Ver I.L., Noise and Vibration Control Engineering: Principles and Applications,
3. Leonard Meirovitch, Fundamentals of Vibrations, Mc Graw Hill New York
4. J.S. Rao and K. Gupta, Advanced theory of Vibration.Willey Eastern.1992.
5. R.A. Collacott, Vibration Monitoring and diagnosis, John Willey, New York, 1979.
6. M. Petyt, Introduction to Finite Element Vibration Analysis, Cambridge University
7. Fundamentals of Mechanical Vibration, S. Graham Kelly, Tata McGraw Hill Pub.

SIMULATION OF I.C. ENGINE PROCESSES

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(8)**

Introduction: Heat of reaction, Measurement of URP, Measurement of HRP, Adiabatic flame temperature, Complete Combustion in C/H/O/N Systems, Constant Volume Adiabatic Combustion, Constant Pressure Adiabatic Combustion, Calculation of Adiabatic Flame Temperature, Isentropic Changes of State.

UNIT-2: **(8)**

SI Engine Simulation: Deviation between Actual and Ideal Cycle, Problems, SI Engine Simulation with Adiabatic Combustion, Efficiency Calculation.

UNIT-3: **(8)**

Progressive Combustion: SI Engines Simulation with Progressive Combustion with Gas Exchange Process, Heat Transfer Process, Friction Calculation, Compression of Simulated Values, Validation of the Computer Code, Engine Performance Simulation, Pressure Crank Angle Diagram and Other Engine Performance.

UNIT-4: **(8)**

Simulation of 2-Stroke SI Engine: Simulate the Performance, Unbalanced Forces on 2-Stroke Engine.

UNIT-5: **(8)**

Diesel Engine Simulation: Multi zone Model for Combustion, Different Heat Transfer Models, Equilibrium Calculations, Simulation of Engine Performance, Simulation for Pollution Estimation.

Text Books:

1. Computer Simulation of spark ignition engine process, *Ganesan.V.*, Universities Press (I) Ltd, 1996.
2. Modelling of Internal Combustion Engines Processes, *Ramoss.A.L.*, McGraw Hill Publishing Co., 1992.

Reference Books:

1. Internal Combustion Engines, *Benson.R.S.*, whitehouse.N.D., Pergamon Press, oxford, 1979.
2. Thermodynamic analysis of combustion engines, *Ashley Campbel, John Wiley & Sons*, New York, 1986.

STATISTICAL QUALITY CONTROL

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction **(10)**

Concept and evaluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standardization & Interchangeability. Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testing & Evaluation.

UNIT-2: Control Charts for SQC **(10)**

Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability.

UNIT-3: Acceptance Sampling for SQC **(10)**

Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables.

UNIT-4: Reliability **(10)**

Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System. Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure. MTBF. Maintainability, Condition monitoring and dignostic techniques. Value Engineering : Elements of value analysis, Techniques.

UNIT-5: TQM **(10)**

Basic Concept, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO 9000 and its series, Zero defect. . Taguchi method, Six Sigma concepts. Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality, Quality circles, Quality in sales & service.

Text Book:

1. Statistical Quality Control, Grant and Leavarworth, McGraw Hill

Reference Book:

1. Introduction to Statistical Quality Control by Douglas C. Montgomery, Wiley

ADVANCED NUMERICAL METHODS

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction

Programming computer, round off error, truncation error, Taylor series.

Interpolation, Extrapolation and Curve Fit

Parabolic interpolation and Extrapolation, Lagrangian interpolation, Richardson's extrapolation, curve fit.
Project – write program for Lagrangian interpolation and Richardson's exptrapolation and evaluate function's value.

UNIT-2: **(10)**

Root finding in one dimension

Successive bisection, Secant method, Newton-Raphson scheme Project – write program for Newton-Raphson scheme and find the root of a given equation.

Differentiation and integration

Divided difference method for differentiation. Trapezium rule, Simpson's rule, Gauss quadrature Project – Write programs for integration of a given function and compare results from various methods and close form solution.

UNIT-3: **(10)**

Linear Equations

Gauss elimination, Tridiagonal matrices, Gauss-Seidel iteration, Eigen values problems,
Project – Write programs and solve linear equations, solve mechanical vibration and buckling proble**m.**

UNIT-4: **(10)**

Ordinary Differential Equations

Finite difference, implicit methods, explicit method, Runge-Kutta methods, Error and step control
Project- One dimensional heat conduction, boundary layer flow

UNIT-5: **(10)**

Partial Differential Eequations

Laplace equation Direct solution , Relaxation , Jacobi, Gauss-Seidel, Relaxation, Poisson equation, Diffusion equation, Stability.
Project - The displacement of a stretched rectangular membrane subjected to a uniform load, two- dimensional heat conduction, and potential flow

Text Books:

1. Numerical Methods, M.K.Jain, S.R.K.Iyengar & R.K.Jain, Newage International (P) Ltd.
2. Introductory Methods of Numerical Analysis, S.S. Sastry, Prentice Hall of India.

Reference Book:

1. "Numerical Recipes in C++ , William H. Press, Saul A. Teukolsky William T. Vetterling, Brian P. Flannery, EXXON Research and Engineering Company

MACHINE DESIGN

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(12)**

Clutches- Introduction, Types of Clutches, Considerations in Designing a Friction Clutch, Design of a Disc or Plate Clutch, Design of a Cone Clutch, Design of a Centrifugal Clutch.

Brakes- Introduction, Materials for Brake Lining, Types of Brakes, Single Block or Shoe Brake, Pivoted Block or Shoe Brake, Differential Band Brake, Band and Block Brake, Internal Expanding Brake.

UNIT-2: **(13)**

Spur Gears:-Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involutes gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

Helical Gears:-Terminology, Proportions for helical gears, Beam strength and wear strength of helical gears, herringbone gears, crossed helical gears, Design of helical gears.

UNIT-3: **(13)**

Bevel Gears:-Classification of Bevel Gears, Formative or Equivalent Number of Teeth for Bevel Gears, Tredgold's Approximation, Strength of Bevel Gears, Forces Acting on a Bevel Gear, Design of a Shaft for Bevel Gears.

Worm Gears:-Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing

UNIT-4: **(12)**

Ic Engine Parts: Selection of type of IC engine, General design considerations, Design of Cylinder and cylinder head; Design of piston, piston ring and gudgeon pin; Design of connecting rod; Design of centre crankshaft

Text Books:

1. Mechanical Engineering Design – Joseph E. Shigely, McGraw Hill Publications
2. Design of Machine Memebers-Alex Valance and VI Doughtie, McGraw Hill Co.

Reference Books:

1. Machine design-M.F. Spott, Prentice Hall India
2. Machine Design-Maleev and Hartman, CBS
3. Machine design -Black & Adams, Mc Graw Hill
4. Machine Design-Sharma and Agrawal, S.K. Katara & Sons
5. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.

INTRODUCTION TO ROBOTICS ENGINEERING

L T P: 4 0 0 **Credit: 4**

UNIT-1: **(10)**

Robot definition: Robotic systems - Its role in automated manufacturing; robot anatomy; robot classifications and specifications.

UNIT-2: **(10)**

Robot kinematics, forward and reverse transformation, homogeneous transformations, Robot actuators and control; Pneumatic, hydraulic and electrical drives and controls used in robots. Robot end-effectors, mechanical, magnetic and vacuum grippers, gripping forces RCC and design features of grippers.

UNIT-3: **(10)**

Robot sensors, different types of contact and non-contact sensors; Robot vision and their interfaces; Robot languages and programming techniques.

UNIT-4: **(10)**

Applications of robots in materials handling, machine loading/unloading, inspection, welding, spray painting and finish coating, and assembly, etc.

UNIT-5: **(10)**

Economic performance and evaluation strategies, Robot installation and planning, Safety features.

Text Books:

1. Industrial Robotic Technology - Programming and Application by M.P.Groover et. al., McGrawhill
2. Introduction to Robotics by J.J.Craig, Pearson Publ1ication

References:

1. Robotics for Engineers by Y. Koren, Mc-Grawhill.
2. Robots Modelling Control and Applications w/ Software by P.G.Ranky and C.Y.Ho, Springer Verlag Berlin.
3. Robotics Technology and Flexible Automation by S.R.Deb, TMH
4. Robotics & Control, Nagrath, TMH
5. Robotics Technology and Flexible Automation by S.R.Deb, TMH.

ROBOTICS AND MANIPULATORS

L T P: 4 0 0 **Credits: 4**

UNIT-1: Basic Concepts **(8)**

Synthesis of Elements with Mobility Constraints, Classification and Specification of Robots, Laws of Robotics, Elements of Robot Anatomy.

UNIT-2: Manipulators **(8)**

Hydraulic, Pneumatic and Electrical manipulators, End Effectors and their Design.

UNIT-3: Sensors: **(10)**

Requirement, Principle and Applications, Types- Tactile and Non-Tactile Type, Sensor Commands, Sensors Position, Robot Controller with Microprocessor or Fluidics.

UNIT-4: Kinematics and Motion Planning of Robot **(12)**

Forward Kinematics, Inverse Kinematics, Joints and links, Kinematics of Manipulators with Two, Three And Four Degrees of Freedom, Drive systems, Motion Commands of Robot.

UNIT-5: Implementation and Robot Economics **(12)**

Introduction to Industrial Robots and Application in Manufacturing: Material Transfer, Material handling, Loading and unloading, Processing, Spot and Continuous arc welding & spray painting, Economics of Robotics.

Text Books:

1. Robotics& Control, *Nagrath* , Tata McGraw Hill
2. Robotics Technology &Flexible Automation, *S. R. Deb* McGraw Hill

Reference Books:

1. Industrial Robotics, Hodges, Jaico
2. Introduction to robotics , *J.J. Graig* , Pearson education

EXPERIMENTAL STRESS-ANALYSIS

L T P: 4 0 0 **Credits 4**

UNIT-1: **(10)**

Importance of experimental methods and their scope; whole field and point by point methods, Static and dynamic problems. Photo Elasticity, Photo elastic effect and polarized light, permanent and temporary birefringence, Optics of plane and circular polariscope: Dark & light background; Isoclinic and isochromatics; stress optics law for two-dimensional problems; secondary principal stresses.

UNIT-2: **(10)**

Photo elastic model materials; preparation of model, firing order, compensation techniques : separation of principal stresses using extensometer, oblique incidence, shear difference and numerical integrations of Laplace's equation : Basic elements of three dimensional photo-elasticity; photo elastic stress and strain gauges; Other Optical Methods

UNIT-3: **(10)**

Surface stress determination using birefringent coating, reinforcing Thickness effect of photo stress coats; moir's method; Scattered light technique in photo elasticity, advantages and scope, scattered light polariscope; elements of holography, preparation and interpretation of holograms.

UNIT-4: **(10)**

Brittle Coating method, Characteristics and methods of applying brittle coatings on components, factors affecting accuracy failure analysis of cracks developed in coating; refrigeration techniques; calibration methods, scope of application.

UNIT-5: **(10)**

Strain Gauge Technique, Review of strain measuring technique: Strain rosettes; transverse sensitivity; graphical and homographic solutions for determination of principal stresses from strain results, stress gauge.

Text Books:

1. Experimental Stress Analysis and Motion Measurements, Dow & Adaws, Prentice Hall.
2. Experimental Stress Analysis, Dally & Riley, McGraw Hill.

Reference Books:

3. Applied Stress Analysis, Durelli, Prentice Hall.
4. Photoelasticity Vol. I & II, Forcht, John Wiley.
5. Introduction to Photmechanics, Durelli & Riley McGraw Hill.

RELIABILITY BASED DESIGN

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction **(8)**

Safety factors, Fallacies in Designing by Safety Factors, Reliability, Probabilistic Reliability, reasons for Probabilistic Approach, Mathematical Considerations: Basic Probability concepts, Random Variables, Expected Values and Moments, Moments of Random Variables Distribution of functions, Moments of Functions, Moments of function of Random Variables.

UNIT-2: Algebra of Normal Functions **(8)**

Independent Binary Operations, Moment Generating Functions, Methods of partial Derivatives, Special correlated combinations.

UNIT-3: Determination of Reliability **(8)**

Generally distributed Allowable and Applied Stress, Determination of reliability when Strength and stress Distribution are Normal, Non-normal distributions.

UNIT-4: Reliability Methods **(8)**

Introduction, Monte Carlo Method, First Order Second Moment Method, and Determination of partial Safety Factors.

UNIT-5: Reliability Based Design **(8)**

Analysis & Design to Tension members, Short columns Long Columns, Beam – Column, simple and Cantilever Beams, example with various discipline.

Text Books:

1. Ranganathan, R., Reliability based design of structures, Tata McGraw Hill Comp. Ltd., New Delhi.

Reference Books:

1. Molton E. harry, Reliability based design in Civil Engineering, Mc-Graw Hill Comp. Ltd., New York.
2. S.J. Rao, “Reliability Based Design” Mc, Graw Hill Inc. New York, 1992.

AUTOMOTIVE TRANSMISSION

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Vehicle Layouts: Introduction, Classification of automobile, Types of chassis layout with reference to power plant locations and type of drive, Types of chassis- fully forward, semi forward, Truck or bus chassis, two & three wheeler chassis layout

Clutches: Principle, functions, general requirements, torque capacity, types of clutches, cone clutch, single-plate clutch, diaphragm spring clutch, multi-plate clutch, centrifugal clutch, electromagnetic clutch, lining materials, over-running clutch, Clutch control systems.

UNIT-2: **(10)**

Gear Box: Necessity of gear box, Resistance to motion of vehicle, Requirements of gear box, Functions of gear box, Types, Sliding mesh, Constant mesh, Synchromesh. Principle, construction and working of synchronizing unit, Requirements & applications of helical gears, Gear selector mechanism, Two wheeler gear box, Lubrication of gear box, Overdrive gears, Performance characteristics.

UNIT-3 **(10)**

Drive Lines: Effect of driving thrust and torque reaction, propeller shaft-universal joints, hooks and constant velocity U.J., Drive line arrangements – Hotchkiss drive & torque tube drive, Rear wheel drive & front wheel drive layouts.

Final Drive & Rear Axle: Purpose of final drive & drive ratio, Different types of final drives, need of differential, Constructional details of differential unit, Non-slip differential, Differential lock, Differential housing, Function of rear axle, Construction, Types of loads acting on rear axle, Axle types - semi-floating, full floating, three quarter floating, Axle shafts, Final drive lubrication.

UNIT-4: **(10)**

Transmission with Fluid Flywheel & Torque converter: Operating principle, Construction and working of fluid flywheel, Characteristics, Advantages & limitations of fluid coupling, Torque converter, construction and working of torque converter, Performance characteristics, Comparison with conventional gear box.

Epicyclic Gear Boxes: Simple epicyclic gear train, Gear ratios, Simple & compound planet epicyclic gearing, Epicyclic gear boxes, Wilson Epicyclic gear train - Construction and operation, Advantages, Clutches and brakes in epicyclic gear train, compensation for wear, performance characteristics.

UNIT-5: **(10)**

Automatic Transmission: Principle of semi automatic & automatic transmission, Hydramatic transmission, Fully automatic transmission, Semi automatic transmission, Hydraulic control system, Continuous variable transmission (CVT) – operating principle, basic layout and operation, Advantages and disadvantages

Text Books:

1.Automatic Transmission, Chek Chart, A Harper & Raw Publication

Reference Books:

Motor Vehicles, Newton, Steed & Garrot, 13th Edition, Butterworths London,

1. Modern Transmission, Judge A. W.,Chapman & Hall Std., 1989
2. Steering, Suspension & Tyres, Giles J. G.,– Lliffe Book Ltd., London
3. Mechanics of Road Vehicles, Steed W., Lliffe Book Ltd.
4. Automotive Mechanics K Giri, Khanna Publishers, Delhi, Eighth Edition

FINITE ELEMENT METHODS

L T P: 4 0 0 **Credits: 4**

UNIT-1: Approximate Solution Methods **(8)**
Ritz and Rayleigh Ritz methods, Method of weighed residuals, General concepts, Point collocation, Subdomain collocation, Least squares, Galerkin method.

UNIT-2: Finite Difference Method **(8)**
Characteristics and classification of PDE, Solution of elliptic, Hyperbolic & parabolic PDE using Finite Difference Method

UNIT-3: Finite Element Method . **(20)**
Introduction to variational calculus, The differential of a function; Euler-Lagrange equation, Geometric & natural boundary conditions, Basic Concept of Finite Element Method, Principle of potential energy; 1D elements, Derivation of Stiffness and Mass matrices for a bar, A beam and A shaft, Comparison with Analytical results; Interpolation and Shape functions; Solution of static problems and case studies in stress analysis of Mechanical components; FEA using 2D and 3D elements; Plain strain and plain stress problems, FE using plates / shell elements

UNIT-4: Isoparametric Elements . **(6)**
Analysis using Isoparametric Elements

UNIT-5: Importance of Finite Element Mesh: **(8)**
Automatic meshing techniques; Case studies using FEM for Design of simple element geometries such as a tapered bar, A plate with a hole

Laboratory Work:
Practice of the concept covered in Lecture. Use of software for Finite Element Analysis.

Text Books:

1. Reddy, J. N., An Introduction to the Finite Element Method, McGraw Hill (2001).
2. Bathe, K. J., Finite Element Procedures, Prentice Hall of India (1996).
3. Chandrupatla, T. R. and Belgundu, A. D., Introduction to Finite Elements in Engineering, Prentice Hall of India (1997).

Reference Books:

1. Zienkiewicz, O. C., The Finite Element Method, McGraw Hill (2002)
2. Huebner, K. H., Dewhirst, D. L., Smith, D. E. and Byrom, T. G., The Finite Element Methods for Engineers, John Wiley and Sons (2000).
3. Buchman, G. R., Finite Element Analysis, Schaum's Outlines, McGraw Hill 1995
4. Jordan, C. Calculus of Finite Differences, American Mathematical Society 1979

COMPUTATIONAL FLUID DYNAMICS

L T P: 4 0 0 **Credits: 4**

UNIT 1: **(10)**

Introduction: Conservation equation; mass; momentum and energy equations; convective forms of the equations and general description.

Classification and Overview of Numerical Methods: Classification into various types of equation; parabolic elliptic and hyperbolic; boundary and initial conditions; over view of numerical methods.

UNIT 2: **(10)**

Finite Difference Technique: Finite difference methods; different means for formulating finite difference equation; Taylor series expansion, integration over element, local function method; treatment of boundary conditions; boundary layer treatment; variable property; interface and free surface treatment; accuracy of f.d. method.

UNIT 3: **(10)**

Finite Volume Technique: Finite volume methods; different types of finite volume grids; approximation of surface and volume integrals; interpolation methods; central, upwind and hybrid formulations and comparison for convection-diffusion problem.

Finite Element Methods: Finite element methods; Rayleigh-Ritz, Galerkin and Least square methods; interpolation functions; one and two dimensional elements; applications.

UNIT 4: **(10)**

Methods of Solution: Solution of finite difference equations; iterative methods; matrix inversion methods; ADI method; operator splitting; fast Fourier transform.

Time Integration Methods: Single and multilevel methods; predictorcorrector methods; stability analysis; Applications to transient conduction and advection-diffusion problems.

Numerical Grid Generation: Numerical grid generation; basic ideas; transformation and mapping.

UNIT 5: **(10)**

Navier-Stokes Equations: Explicit and implicit methods; SIMPLE type methods; fractional step methods. Turbulence modeling: Reynolds averaged Navier-Stokes equations, RANS modeling, DNS and LES.

Textbooks and References:

1. Ferziger, J. H. and Peric, M. (2003). Computational Methods for Fluid Dynamics. Third Edition, Springer-Verlag, Berlin.
2. Versteeg, H. K. and Malalasekara, W. (2008). Introduction to Computational Fluid Dynamics: The Finite Volume Method. Second Edition (Indian Reprint), Pearson Education.
3. Anderson, D.A., Tannehill, J.C. and Pletcher, R.H. (1997). Computational Fluid Mechanics and Heat Transfer. Taylor & Francis.

STATISTICAL PROCESS CONTROL

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction**,** The Meaning of Quality and Quality Improvement; Brief History of Quality Methodology; Statistical Methods for Quality Control and Improvement; Total Quality Management (quality philosophy, links between quality and productivity, quality costs legal aspects of quality implementing quality improvement). Modeling Process Quality Frequency distribution and histogram, numerical and graphical descriptive statistics, some important discrete and continuous probability models; some useful approximations.

UNIT-2: **(10)**

Inferences about Process Quality**,** Sampling distributions, estimation and confidence interval for process, parameter(s), hypothesis testing on process parameter(s) and power analysis. Methods and Philosophy of Statistical Process Control, Chance and assignable causes, Statistical Basis of the Control Charts (basic principles, choices of control limits, sample size and sampling frequency, rational subgroups, analysis of pattern on control charts, warning limits, ARL, sensitizing rules for control charts); Deming's Magnificent Seven Implementing SPC; An Application of SPC; Nonmanufacturing application of SPC.

UNIT-3 **(10)**

Control Charts for Variables, Control Charts for $\bar{X}$ and R (statistical basis, development and use, estimating process capability; interpretation, the effect of non normality on the chart, the OC function, average run length); Control Charts for $\bar{X}$ and S; Control Chart for Individual Measurements; Applications of Variables Control Charts. Control Charts For Attributes, Control Chart for Fraction Nonconforming (OC curve of the control chart, variable sample size, nonmanufacturing application, the OC function and ARL calculation); Control Charts for Nonconformities or Defects; Choices Between Attribute and Variable Control Charts, Guideline for Implementing Control charts.

UNIT-4: **(10)**

Process and Measurement system Capability Analysis **(PCA),** PCA analysis using a histogram or a probability plot, process capability ratios, confidence interval for process-capability ratio, PCA using a control chart, estimating natural tolerance limits of a process. Cumulative-Sum (CUSUM) & Exponentially Weighted Moving Average (EWMA) Control Charts , CUSUM Control Chart (basic principles of the chart for monitoring the process mean, tabular or algorithmic CUSUM, recommendation for CUSUM design, the standardized CUSUM, rational subgroups, improving the responsiveness of the CUSUM for large shifts, designing a V-Mask, designing CUSUM based on ARL, one sided CUSUM); EWMA control chart (EWMA control chart for monitoring process mean, design of an EWMA control chart, rational subgroups); The moving Average Control Chart.

UNIT-5: **(10)**

Lot-By-Lot Acceptance Sampling For Attributes, **,**The accepting sampling problem, single sampling plan for attributes, Double, Multiple, and sequential sampling, Military Standard 105E, the Dodge-Roming sampling plans (AOQLand LTPD plans).

Text Books:

1. "Introduction to Statistical Quality Control", D. C. Montgomery, 4th edition 2001, Wiley publisher.

Reference Books:

1. "Statistical Quality Control" by E.L. Grant and R.S. Leavenworth, 6th edition, McGraw-Hill publisher.
2. "Principles of Quality Control", by Jerry Banks, Wiley publisher.

POWER PLANT ENGINEERING

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction **(10)**

Rankine cycle with reheat & regeneration; Binary vapour cycle and flow through nozzles; Energy resources & development of power in India; Hydro, thermal and nuclear energy; present power position & Future planning of policies in India.

UNIT-2: Thermal Power Plants **(10)**

Introduction, Fossil fuel & its resources; Fuel properties and storage, Classification of coal; Use of high ash coal, Lignite coal, Drying, Storage and handling of liquid fuels, Types of petroleum fuels; Producer gas; Fuel firing; Furnaces construction; Grates; Pulverizes; Oil & gas burners and fluidized bed combustion system, Ash handling and flue gas analysis; High pressure boilers; Super critical boilers; Steam plant accessories; Effect of component characteristics on the plant performance and variable load problem.

UNIT-3: Diesel Electric Power Plants **(10)**

Field of use, Outline of diesel power plant, different systems, Super charging, Diesel plant efficiency & heat balance, Research in diesel power plant. Gas Turbine Plants: Introduction, Classification; Types of gas turbine plants; Analysis of closed and open cycle, Constant pressure gas turbine plants; Methods to improve the thermal efficiency of a simple open cycle constant pressure gas turbine plant; Auxiliaries & controls. Environmental impact of gas turbine power plants.

UNIT-4: Hydro Electric Power Plants **(10)**

Hydrology-rainfall, Runoff & its measurement, Hydrograph & storage of water; Classification of Hydro units; Design, construction & operation of different components of hydroelectric power stations. Nuclear Power Plants: Principles of nuclear energy; Classification, Main parts of nuclear reactors; Types of reactors; PWR, BWR, Heavy water reactors, gas cooled reactor, Liquid metal cooled reactors; Organic moderated cooled reactors, Breeder reactors plant operation, safety features & Radioactive waste disposal.

UNIT-5: Non-Conventional Power Generation **(10)**

Introduction; Geo thermal power; Tidal; solar & Wind power plants and direct energy conversion systems. Economic analysis of Power Plants and its Tariffs: Instrumentation & control in thermal power plants, energy conservation & management. Environmental aspects of Power Generation: Pollutants from fossils fuels and health hazards Control of emissions and particulate matter, desulfurization, Coal gasification & Introduction to greenhouse effect.

Text Books:

1. Power Plant Engineering, A. K. Raja, Amit Prakash Srivastava, New Age International
2. Large-Scale Solar Thermal Power: Technologies, costs and development, Werner Vogel, Henry Kal
3. Power Plant Engineering, Nag P K, Tata Mcgraw Hill Education Private Limited

Reference Books:-

1. Power Plant Engineering by Black & Veatch, Kayla L. Westra, Lawrence F. Drbal, CBS Publishers & Distributors-new Delhi
2. Power Plant Design (Energy And Engineering Science) by E. E. Khalil, Taylor & francis Publisher

NUCLEAR POWER

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction; Atoms and Nuclei; Number Density Relativity; Photons, Atomic–Nuclear Models; Nuclear Stability, Binding Energy, Nuclear Reactions, Q-value, Radioactive Decay, Decay Value, Transmutation, Compound Decay, Decay Chains, Natural Radioactivity.

UNIT-2: **(10)**

Binary Reactions, Neutron Reactions, Fission, Fusion, Attenuation, Flux, Cross-sections, Reaction Rates, Point Source, Photon Interactions, Neutron Interactions, Charged Particles Interactions, Radiation Dose, Dose Units, Exposure, Biological Effects.

UNIT-3: **(10)**

Moderation; Nuclear Fuel; Criticality; Multiplication Factor; Four Factor Formula, Critical Reactor Core, Reactor Kinetics, Delayed Neutrons, Reactor Dynamics, Reactivity ,Feedback,

UNIT-4: **(10)**

Electric Power Generations, Gen II PWRs and BWRs, Nuclear Power Generations, Generation III and IV Plants, Nuclear Fuel Cycles, Nuclear Waste Disposal, Nuclear Propulsion, Fusion; Space Reactors.

UNIT-5: **(10)**

Thermoelectric Generators; Thermionics; Direct Energy Conversion; Radioisotopic Power Sources, Three Mile Island; Chernobyl

Text Book:

1. J. K. Shultis and R. E. Faw, Fundamentals of Nuclear Science and Engineering, 2nd ed., CRC Press, 2008.

Reference Book:

1. Power Plant Engineering By A. K. Raja, Amit Prakash Srivastava,New Age International

ENERGY MANAGEMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction: Energy sources, energy demand and supply, Energy crisis, future scenario; Energy system efficiency; energy conservation aspects; Instrumentation and measurements. Principles of Energy Management and Energy Audit: General principles, planning and program; Introduction to energy audit; General methodology; Site surveys; Energy systems survey, energy audit; Instrumentation; Analysis of data and results, Introduction to smart grid concept.

UNIT-2: **(10)**

Heating and Cooling Management: General principles of energy managements in HVAC systems; Human comforts and health requirements; HVAC systems; Boiler and heat sources; Chillers, fans, pumps, cooling towers, Energy management opportunities; Modelling of heating and cooling loads in buildings.

Electrical Load and Lighting Management: General principles; Illumination and human comfort; Lighting systems; Equipments; Energy management opportunities; Electrical systems; Electrical load analysis; Peak load controls.

UNIT-3: **(10)**

Process Energy Management: Principles; Process heat, Combustion, Automatic fuel controls; Steam generation and distribution, Hot water and pumping, Furnaces and ovens; Process electricity; Compressed air; Manufacturing process; Energy storage for process industries; Process control.

UNIT-4: **(10)**

Integrated Building Systems: General principles; Environment conformation; Passive design considerations; Building envelope design consideration, Integration of building system, Energy storage-cold storage techniques, Economic analysis.

UNIT-5: **(10)**

Economic Aspects of Energy Management: General considerations; Economic analysis methods; Life-cycle costing, Break even analysis, benefit cost analysis, payback period analysis, present worth analysis, equivalent annual cost analysis, Use of computers; Management of energy with environment aspects.

Text Book:

1. Energy Management, W R Murphy; G Mckay B.S. Publications

Reference Books:

1. Rural Energy Management, S Kaushik, T Verma Deep and Deep Publs.
2. Renewable Energy and Energy Management, S C Patra; B C Kurse; R Kataki International Book Co.
3. Operations and Maintenance Manual for Energy Management, J Piper,

NON-CONVENTIONAL ENERGY RESOURCES

L T P: 4 0 0 **Credits: 4**

UNIT 1:

Introduction **(10)**

Burgeoning Population and their Energy Needs, Exhaustibility of Non-renewable or Conventional, Energy Resources, Status of India versus World for Sustainable Development, Non-Conventional Energy: Rationale, Introduction, Availability, Classification, Merits and Demerits.

Solar Cells

Theory of Solar Cells, Solar Cell Materials or Photovoltaics: Monocrystalline Silicon, Poly Crystalline Silicon, Amorphous Silicon, GaAs; Solar Cell Arrays, Solar Cell Power Plants, Limitations, Efficiency of Conversion, Cost of Energy.

UNIT 2:

Solar Thermal Energy **(10)**

Solar Radiation, Flat Plate Collectors: Materials, Applications and Performance, Focused Collectors: Materials, Applications and Performance.

Solar Thermal Energy Production

Solar Heating: Active, Passive; Solar Thermal Power Plants, Solar Farms in India.

Solar Thermal Energy Storage and Transmission

Thermal Energy Storage for Solar Heating and Cooling, Limitations, Grid-connected PV Systems.

UNIT 3:

Geothermal Energy **(10)**

Geothermal Energy: Resources, Physics and Thermodynamics, Electrical Conversion, Non-electrical, Conversion, Environmental Considerations, Recent Experiences.

Ocean Thermal Energy

Ocean Thermal Energy Conversion (OTEC): Availability, Principle, Performance Limitations.

Tidal Energy

Principle of working, performance and limitations.

UNIT 4:

Wind Energy **(10)**

Wind Power: Sources, Site Selection Criterion; Moment um Theory, Classification of Rotors, Concentrations and Augments, Wind Characteristics, of Energy Conversion Systems: Performance and Limitations. Wind Farms in India.

Hydrogen Energy

Fuel Cells: Principle, Types, Performance and Limi tations; Hydrogen Energy: Production, Storage, Safety, Applications.

UNIT 5:

Bio Energy **(10)**

Bio-Mass: Types, Availability, Conversion Theory; Bio-mass (algae) Conversion for Gl obal Warming. Reduction, waste recycling plants, Potential in India.

Fusion Energy

Magneto-Hydrodynamics (MHD) Power Plant: Principle, Performance and Limi tations. Confinement: Magnetic, Plasma, Energy.

Framework: Policy and Regulatory

Alternative Energy India: Progressive Policies, Regulations and Mechanisms of Funding, Comparative studies with world.

Text Book:

1. Non-Conventional Energy Resources, D.S Chauhan and S.K. Srivastav, New Age International

Reference Books:

1. Energy Science: Principles, Technologies and Impacts, John Andrews, Nick Jelley, Oxford University Press.
2. Renewal Energy Technologies: A Practical Guide for Beginners, C.S. Solanki, Prentice Hall of India.
3. Energy Resources: Conventional & Non-Conventional, M.V.R. Koteswara Rao, BS publication

ADVANCED MATERIALS AND NANO MATERIALS

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction **(10)**

Introduction (1)
Need for Advanced and Future Materials, Future of Science and Technology.

Advanced Materials (3)
Al-alloys, Superalloys, Intermetallics and IMCs, Quasi Crystals, Metallic Glasses, Composites;

Functional Materials (3)
Semiconductors, Superconductors, Shape Memory Alloys, Smart Materials.

Nano Materials and Nano Science and Technology (3)
Definition, History of Development, Feynman's Lecture, Scale of Development: Past, Present, Future; Approaches in Nano Science, Interdisciplinary Nature, Ethical and Societal Considerations in Nano Science.

UNIT-2: Advanced Materials **(10)**

Al Alloys and Superalloys (3)
Requirements for Air Transportation, Precipitation Hardening, Al-Cu Alloys, Al-Li alloys, Al-Mg alloys; Turbine Blades, Directional Solidification, Oriented Polycrsyals and Single Crystals, Alloy Design, Ni-base Superalloys.

Intermetallics and IMCs (2)
Order-Disorder Transformation, Superlattices, Aluminides, Silicides, Intermetallic Matrix Composites, Silicide Matrix Composites.

Quasicrystals and Metallic Glasses (2)
Rapid Solidification Processing, Amorphous Alloys, Quasicrystals, Metallic Glasses.

Composites (3)
Definition, Types: PMCs, MMCs, CMCs, IMCs, SMCs; Components: Matrices, Reinforcements, Interfaces; Processing Methods, *in situ* Composites; Applications.

UNIT-3: Functional Materials **(10)**

Semiconductors and Superconductors (4)
Insulators, Conductors, Semiconductors, Electrons-Holes, Charge Carriers, Energy Bands and Conduction, Extrinsic and Intrinsic Semiconductors, Doping; Superconductors, Definition, Types, Meissner Effect, Development, High T Superconductivity, Superconducting Materials, Present and Future of Applications.

Shape Memory Alloys (2)
Reversible Transformations, Shape Memory Alloy Effect, Magnetic Shape Memory alloys, One-way and Two-way Effects, Compositions, Present and Future Applications.

Smart Materials (4)
Piezoelectric Materials, Magnetostrictive Materials, Electrochromic Materials, Photochromic Materials, Photoelectric Materials, Photomechanical Materials.

UNIT-4: Nano Science **(10)**

Structure and Properties (3)
Size Dependence of Properties, Face Centered Cubic Nanoparticles, Tetrahedrally-bounded Semiconductor Structures, Size and Dimensionality Effects, Fermi Gas.

Energy Bands (2)
Reciprocal Space, Energy Bands and Gaps of Semiconductors, Effective Masses, Fermi Surface.

Quantum Theory for Nano Science (4)
Time-dependent and Time independent Schrodinger Wave Equations; Particle in a Box, Potential Step: Reflection and Tunneling (Quantum Leak), Penetration of Barrier, Potential Box: Trapped Particle in 3D (Nano Dot), Electron Trapped in 2D Plane (Nano Sheet), Quantum Confinement Effect in Nano Materials.

Localized Particles (1)
Acceptors, Deep Traps, Mobility, Excitons.

UNIT-5: Nano Materials and Nano Technology **(10)**

Metal Nano Clusters (1)
Magic Numbers, Geometric Structure, Electronic Structure, Reactivity.

Rare Gas & Molecular Clusters (1)
Inert Gas Clusters, Superfluid Clusters, Molecular Clusters.

Buckey Balls and Carbon Nanotubes (3)
Nanostructures of Carbon- Fullerenes, Bucky Ball Structures; Chirality, Carbon Nano Tubes, Fabrication, Structure. Electrical, Mechanical and Vibrational Properties, Applications.

Other Nano Materials (4)
Nano Diamond, Single Electron Transistors, Infrared Detectors, Quantum Dot Laser, Molecular Machine, Nano-Biometrics, Nano Robots, Nano Textiles, Nano Powders, Nano Composites.

Nano Ethics and Future (1)
Ethics, Visions of Future Life, Implications for Society.

Textbooks:

1) Introduction to Nanotechnology, *C.P. Poole Jr., F.J. Owens,* John Wiley & Sons, 2003.
2) Nano: The Essentials- Understanding Nanoscience and Nanotechnology, *T. Pradeep*, Tata McGraw Hill, 2007.
3) Concepts of Modern Physics, *Arthur Beiser*, Tata McGraw Hill
4) Nanotechnology: Fundamentals and Applications, *Manasi Karkare*, I.K. Intl., 2008.
5) Engineering Materials: Polymers, Ceramics & Composites, *A.K. Bhargava*, Prentice Hall India, 2010.
6) Electrical Properties of Materials, *L. Solymar and D. Walsh*, Oxford Univ. Press, 2010.
7) Smart Materials, *M.V. Gandhi, B.S. Thompson*, Chapman & Hall, 1992.

Reference Books:

1) Nano Materials, *A.K. Bandyopadhyay*, New Age Intl., 2010.
2) Alloy Design, Ed. *S. Ranganathan, V.S. Arunachalam, R.W. Cahn*, Indian Acad. Sciences, 1981
3) Physical metallurgy and Processing of Intermetallic Compounds, Ed. *N.S. Stoloff, V.K. Sikka*, CBS Publishers, 1997.
4) Composites: Science and Engineering, *K.K. Chawla*, Springer Verlag, 1998.

Annexure-XXII-A of Agenda Item no. 6.21

Syllabus of 4th Year (Semester VII)

PCM-401: Professional Skills Enhancement (PSE)

LTP– 2-0-4 Credits - 04

UNIT 1 **Introduction to the Corporate environment (2)**

Expectations from a fresh graduate
Role and Responsibilities
Matching industry's expectations with candidates'

UNIT 2 **Towards Increasing Efficiency and Effectiveness at Workplace (4)**

Interpersonal Skills like problem solving, listening and feedback, handling criticism, etc --- Case studies highlighting interpersonal behavior
Leadership and Team working
Adaptability and Flexibility in the work environment
Input from psychology: perception, developing positive attitude towards people and work. Conflict resolving, , Emotional control: EQ.

UNIT 3 **Aptitude in Business English Communication (Revision exercises and Tests) (8)**

Ability to construct meaningful sentences in a formal setting
Ability to read and comprehend (short articles), Write effective summaries.
Ability to communicate in writing (letters, memos, emails)
Ability to speak coherently and convey the required message in a group setting (Role Plays)

UNIT 4 **Personality Tree Exercise to identify personality traits (2)**

Understanding of one's value system, life structure, relationships, qualities, aspirations, accomplishments, areas of improvement, through a group participatory exercise
How to leverage on the Personality Tree output during the interview
Identify own traits required for the job applied for
Match them with own traits to show an optimum fit
(Videos on psychological aspects to create understanding of Interpersonal behavior)

UNIT 5 **Group Discussions (GD) (10)**

Types of GDs
Techniques for success in GDs
Body Language, Communication, Content, Teamwork, Leadership
DOs and DON'Ts
Mock GD sessions (Topics and Case based)

Demonstration and Practice with emphasis on four main areas viz. Communication skills, Thought content, Group dynamics, Team working and leadership

UNIT 6 **Preparing for Personal Interviews** **(10)**

Pre-interview planning
Dress Code
Body Language
HR Interviews-Analytical and Behavioral Interviews
Stress Interviews
DOs and DON'Ts
Mock Interviews in class for demonstration purposes
Golden Questions and how to develop answers to them
Resume Writing/Covering Letter
Art of presenting oneself with confidence in a natural manner

UNIT 7 **Corporate Culture -** **(2)**

Corporate Etiquette. Work ethics in a corporate environment

UNIT 8 **Ethics and Values Based Behaviour** **(2)**

Case studies and exercises

UNIT 9 **Problem solving and Aptitude Test** **(10)**

Theory
Practical

Annexure-XXII-A of Agenda Item no. 6.21

Ongoing B.Tech.

in

Electronics and Communication Engineering

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2009-2010)

Department of Electronics and Communication Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Electronics and Communication Engineering	
School:	School of Engineering and Technology	
Name of the Course:	Ongoing B.Tech. in ECE (Term-VII and Term-VIII)	
Total No. of Credits:	58	
Date of meeting of BOS:	July 12, 2012	
Status:	Approved by BOS	
Members of BOS:	1. Prof. R. M. Mehra, HOD, ECE	Chairman
	2. Prof. H. M. Gupta, IIT Delhi	External Member
	3. Prof. Avinashi Kapoor, University of Delhi	External Member
	4. Dr. Rajeev Srivastava, ST Microelectronics	External Member
	5. Dr. Amitava Majumdar, Moser Baer India	External Member
	6. Mr. Sandeep Singh, Coordinator, ECE	Internal member
	7. Ms Rashmi Priyadarshini, ECE	Internal member
	8. Ms Noor e Zahra, ECE	Internal member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

Sharda University
School of Engineering and Technology
Department of Electronics & Communication Engineering.

Course Structure

Level 4/Term VII

Sr. No.	SUBJECT CODE	Title of paper	HOURS				CREDITS
		THEORY	L	T	P	TOTAL	
1.	HMM 401/ HMM 402/ /PCM 401	Human Resource Management/ Sales and Distribution Management/ Professional Skill Enhancement	4	1	-	5	4
2.	ECE 401	Optical Communication	4	1	-	5	4
3.	ECE 402	CMOS VLSI Design	4	1	-	5	4
4.	ECE 007 ECE 008	**D elective 5** (a) Data Communication Networks (b)Digital System Design by HDL/VHDL	4	1	-	5	4
5.	ECE 006 ECE 009	**D elective 6** (a) Wireless and Mobile Communication (b) Satellite Communication	4	1	-	5	4
6.	OEL 015 OEL 020 OEL 021 OEL 022	**O elective** (a)JAVA and Application oriented Programming (b) Open Source Development & Technology (c) Measurement Techniques and Industrial Electronics (d) Robotics & Mechatronics	4	1	-	5	4
7.	ECE 453	**Technical Seminar**	-	-	-	-	4
PRACTICALS							
8.	ECE 451	Communication Lab-II	-	-	2	2	1
9.	ECE 452	CMOS Circuit Design Lab	-	-	2	2	1
		TOTAL	24	6	4	34	**30**

Sharda University
School of Engineering and Technology
Department of Electronics & Communication Engineering.

Course Structure

Level 4/Term VIII

Sr. No.	SUBJECT CODE	Title of paper	HOURS				CREDITS
		THEORY	L	T	P	TOTAL	
1.	HMM 402 HMM 401 /PCM 401	Sales and Distribution Management Human Resource Management Professional Skill Enhancement	4	1	-	5	4
2.	ECE 454	Project based on @ Lab VIEW, MAT Lab, VHDL, E-CAD and Embedded system etc.	-	-	-		12
3.	ECE 010 ECE 011 ECE 012	**D elective 7** (a) Low Power VLSI design (b) Microwave Integrated circuits(MIC) (c) CMOS Analog VLSI Design	4	1	-	5	4
4.	ECE 013 ECE 014 ECE 015	**D elective 8** (a) Electronic Switching (b) Optical Networks (c) Analog Signal Processing	4	1	-	5	4
5.	OEL 023 INT 005 OEL 024 OEL 025 OEL 026 OEL 027	**O elective** (a) Design & control of Embedded system (b) Mobile Computing (c) MEMS and systems on chip (d) Application of Power Electronics to power system (e) Bio-Instrumentation (f)Embedded RF system and high frequency signal processing	4	1	-	5	4
		TOTAL	16	4		20	**28**

Total Credits=58

Ongoing B.Tech.

in

Electronics and Communication Engineering

SYLLABI

ECE 401: Optical Communication

LT P: (4-1-0) **Credit: 4**

Unit-1: Overview of optical fiber communication

The general system, advantages of optical fiber communications. Optical fiber wave guides- Introduction, Ray theory transmission. Optical fiber Modes and configuration, Mode theory for circular Waveguides, Step Index fibers, Graded Index fibers.

Single mode fibers- Cut off wavelength, Mode Field Diameter, Effective Refractive Index.

Unit-2: Signal distortion in optical fibers

Attenuation, Absorption, Scattering and Bending losses, Core and Cladding losses. Information capacity determination, Group delay, Attenuation Measurements Techniques, Types of Dispersion - Material dispersion, Wave-guide dispersion, Polarization mode dispersion, Intermodal dispersion. Pulse broadening. Overall fiber dispersion in Multi mode and Single mode fibers, Non linear effects.

Unit-3: Optical Sources

LEDs, Structures, Materials, Quantum efficiency, Power, Modulation, Power bandwidth product.

Laser Diodes- Basic concepts, Classifications, Semiconductor injection Laser, Modes, Threshold conditions, External quantum efficiency, Laser diode rate equations, resonant frequencies, reliability of LED & ILD

Unit-4: Source to fiber power launching

Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors.

Unit-5: Link Design

Point to Point Links, Power Penalities, Error control, Multichannel Transmission Techniques, WDM concepts and component overview, OTDR and optical Power meter

TEXT/REFERENCE BOOKS:

1. John M. Senior, “Optical Fiber Communications”, PEARSON, 3rd Edition, 2010.
2. Gerd Keiser, “Optical Fiber Communications”, TMH, 4th Edition, 2008.
3. Joseph C. Plais, “Fiber Optic Communication”, Pearson Education, 4th Ed, 2004

ECE 402: CMOS VLSI Design

LT P: (4-1-0) **Credit: 4**

Unit-1: Introduction

Overview of VLSI Design Methodologies, VLSI Design Flow, Design Hierarchy, Concepts of Regularity, Modularity and Locality.
MOSFET Fabrication: Fabrication process flow, NMOS and CMOS fabrication, layout design rules, stick diagram and mask layout design.
***MOS Transistor*:** MOS Structure, The MOS System under external bias, Operation of MOSFET, MOSFET - Current /Voltage Characteristics, Scaling and Small geometry effects and capacitances

Unit-2: MOS Inverters

Introduction, Resistive Load Inverter, Inverters with n-type MOSFET load, CMOS Inverter.
MOS Inverters - Switching Characteristics: Introduction, Delay – Time Definitions, Calculation of Delay Times, and Inverter Design with Delay Constraints.

Unit-3: Combinational MOS Logic Circuits

Introduction, MOS logic circuits with depletion NMOS Loads, CMOS logic circuits, complex logic circuits, CMOS transmission gates (pass gates)

Sequential MOS Logic Circuits: Introduction, behavior bistable elements, SR latch circuits, clocked latch and FF circuits, CMOS D latch and edge triggered FF.

Unit-4: Dynamic logic circuits

Introduction, basic principle of pass transistor circuits, synchronous dynamic circuit techniques, dynamic CMOS circuit techniques, domino CMOS logic.

Unit-5: Low – Power CMOS Logic Circuits

Introduction, Overview of Power Consumption, Low – Power Design through voltage scaling, Estimation and Optimization of switching activity, Reduction of Switched Capacitance and Adiabatic Logic Circuits.

TEXT/REFERENCE BOOKS:

1. Sung-Mo Kang & Yosuf Leblebici, “CMOS Digital Integrated Circuits: Analysis &

Design", TMH, 3rd Edition.
2. D. A. Pucknell and K. Eshraghian, "Basic VLSI Design: Systems and Circuits", PHI, 3rd Ed.
3. W. Wolf, Modern VLSI Design: System on Chip, Third Edition, Pearson, 2002.

ECE 007: Data Communication Network

LT P: (4-1-0) **Credit: 4**

Unit-1: **Introduction to data communication**

Goals and Applications of Networks, LAN, WAN, MAN, Wireless network, Protocol hierarchies, design issues of layers, Interfaces and services. Reference Model: The OSI reference model, TCP/IP reference model, The Internet.
Physical Layer:Maximum data rate of a channel, Transmission media, Wireless transmission, Circuit switching, Packet switching, network topology.

Unit-2: **Data Link Layer**

Data link layer design issues, services provided to network layers, Framing, Error control, Flow control, Error detection and correction, Elementary data link protocols, An unrestricted Simplex protocol, A Simplex Stop-and-Wait protocol, Simplex Protocol for a noisy channel, Sliding Window protocols, A protocol using go-back-N, A protocol using selective repeat, Example data link protocol- HDLC, PPP and SLIP.

Medium Access Sub layer: Channel Allocations, Static and dynamic allocation in LAN, Multiple Access protocols, ALOHA, Carrier Sense multiple access protocols, Wireless protocols, Collision free protocols, Limited contention protocols, IEEE standard 802.3 and Ethernet, IEEE standard 802.4, Token bus IEEE standard 802.5, Token Ring, Distributed Queue Dual bus, Logical link control, bridges, High speed LAN.

Unit-3: Network Layers

***Network Layer*:** Network Layer design issue, Routing algorithms, Congestion Control Algorithms, Internetworking.
***Transport Layer*:** Transport services, Design issues, elements of transport protocols, simple transport protocols, Connection management, TCP, UDP.

Unit-4: Session, Presentation and Application Layer

Session Layer - Design issues, remote procedure call. Presentation Layer - Design issues, Data compression techniques, cryptography. Application Layer - File Transfer, Access and Management, Electronic mail, Virtual Terminals.

ISDN Narrowband ISDN, Broadband ISDN and ATM, Virtual circuits

TEXT/REFERENCE BOOKS:

1. A.S. Tanebaum, Computer Networks, 3rd Edition, Prentice Hall India.
2. S. Keshav, an Engineering Approach on Computer Networking, Addison Welsey.
3. W. Stallings, Data and Computer Communication, Macmillan Press.

ECE 009: Satellite Communications

LT P: (4-1-0) **Credit: 4**

Unit-1: Introduction

Elements of Satellite Communication. Orbital mechanics, look angle and Orbit determination, launches & launch vehicle, orbital effects, Geostationary Orbit.

Unit-2: Satellite Subsystem

Attitude and orbit control systems, TTC&M, communication subsystem, satellite antenna
Satellite link design: basic transmission theory, system noise temperature and G/T ratio, downlink design, uplink design, satellite systems using small earth station, design for specified C/N.

Unit-3: Propagation effects and their impact on satellite-earth links

Attenuation and depolarization, atmospheric absorption, rain, cloud and ice effects etc. Introduction of various satellite systems: VSAT, low earth orbit and nongeostationary,

Unit-4:

Direct broadcast satellite television and radio, satellite navigation and the global positioning systems, GPS position location principle, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS,Signal Levels, Timing accuracy, GPS Receiver Operation

Unit-5: Global Mobile Satellite Systems

Antenna System for mobile satellite applications, Evolution, Antenna Requirement and Technical Characteristics, Classification of Mobile Satellite Antenna (MSA), Low gain
omni directional Antenna, Medium gain Directional Antenna, High gain Directional Aperture Antenna, Wire Quadrifilar Helix Antenna(WQHA) for Hand held Terminals, Antenna Systems for Mobile Satellite Broadcasting.

TEXT/REFERENCE BOOKS:

1. B. Pratt, A. Bostian, “Satellite Communications”, Wiley India.
2. D. Roddy, “Satellite Communications”, TMH, 4th Ed.
3. S. D. Ilcev, “Global Mobile Satellite Communication”, Springer
4. R. Pandya, “Mobile and Personal Communication Systems and Services”, PHI.

ECE 006: Wireless and Mobile Communication

LT P: (4-1-0) **Credit: 4**

Unit-1: Evolution of mobile radio communication fundamentals.

Large scale path loss: propagation models, reflection, diffraction,
scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels.
Small scale Multipath Measurements, Parameters of Mobile Multipath Channels types of small scale fading.

Unit-2: Fundamentals of equalization

Equalisers in communication receiver, Survey of equalisation techniques, linear equaliser, Algorithms for Adaptive Equalization, Diversity techniques, RAKE receiver.
Characteristics of speech signals, quantisation techniques, vocoders, linear predictive coders, Multiple Access techniques for Wireless Communications.

Unit-3: Cellular concepts

Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.

Unit-4: GSM system for mobile

Services and features, System Architecture, Radio Sub system Channel types, Frame Structure.
CDMA Digital Cellular Standard (IS 95): Frequency and Channel specifications, Forward CDMA channel and reverse CDMA channel

Unit-5: Introduction to Mobile Adhoc Networks

Mobile data networks, wireless standards IMT2000, Introduction to 4G and concept of NGN.

TEXT/REFERENCE BOOKS:

1. T.S. Rappaport, "Wireless Communication-Principles and practice", Pearson, Second Edition.
2. T L Singal ,"Wireless Communications ",McGraw Hill Publications.
3. R. Pandya, " Mobile and personal communication system", PHI.
4. Andrea Goldsmith, "Wireless Communications", Cambridge University press.
5. Andreas F. Molisch, "Wireless Communications", Wiley Student Edition.
6. S. Haykin & M. Moher, "Modern wireless communication", Pearson, 2005.

ECE 008: Digital System Design by HDL/VHDL

LT P: (4-1-0) **Credit: 4**

Unit-1: Introduction

Introduction to VHDL, reserve words, structures, modeling, objects, data type and operators, sequential statements and processes, sequential modeling and attributes, conditional assignment, concatenation and case, array loops and assert statements, subprograms.

Unit-2: Digital System Design Automation

Abstraction Levels, System level design flow, RTL design flow, VHDL.
RTL Design with VHDL – Basic structures of VHDL, Combinational circuits, Sequential circuits, Writing Test benches, Synthesis issues, VHDL Essential Terminologies
VHDL Constructs for Structures and Hierarchy Descriptions – Basic Components, Component Instantiations, Iterative networks, Binding Alternatives, Association methods, generic Parameters, Design Configuration

Unit-3: Concurrent Constructs for RT level Descriptions

Concurrent Signal Assignments, Guarded signal assignment Sequential Constructs for RT level Descriptions – Process Statement, Sequential WAIT statement, VHDL Subprograms, VHDL library Structure, Packaging Utilities and Components, Sequential Statements.
VHDL language Utilities - Type Declarations and Usage, VHDL Operators, Operator and Subprogram overloading, Other TYPES and TYPE– related issues, Predefined Attributes

Unit-4: VHDL Signal Model

Characterizing hardware languages, Signal Assignments, Concurrent and Sequential Assignments, Multiple Concurrent Drivers Standard Resolution

Unit-5: Hardware Cores and Models

Synthesis rules and styles, Memory and Queue Structures, Arithmetic Cores, Components with Separate Control and Data parts.
Core Design Test and Testability - Issues Related to Design Test, Simple Test benches.

TEXT/REFERENCE BOOKS:

1. Z. Navabi, "VHDL-Modular Design and Synthesis of cores and Systems", TMH – 3rd Edition.
2. R.D.M. Hunter, T. T. Johnson, "Introduction to VHDL" Spriger Publication, 2010.
3. C. H. Roth, "Digital System Design using VHDL", PWS Publishing
4. Douglas Perry, "VHDL- Programming by examples", MGH

ECE 014: Optical Networks

LT P: (4-1-0) **Credit: 4**

Unit-1
The Electromagnetic Spectrum, Properties of Light, Dual Nature of Light Concept of a photon, Wave Model, Characteristics of light waves evolution of Basic Fiber Optical Communication System, Advantages and disadvantages of Fiber Optics.

Optical fiber waveguides: structure of optical wave guide, light propagation in optical fiber using ray theory, acceptance angle, numerical aperture, skew rays, wave theory for optical propagation, modes in a planar and cylindrical guide, mode volume, single mode fibers, cutoff wavelength, mode field diameter, effective refractive index and group and mode delay factor for single mode fiber.

Unit-2
Transmission Characteristics of Optical fiber, Attenuation in optical fibers, intrinsic and extrinsic absorption, linear and non linear scattering losses, fiber bend losses. Dispersion and pulse broadening, intramodal and intermodal dispersion for step and graded index fibers, modal noise, over all fiber dispersion for multimode and mono mode fiber, dispersion shifted fibers, modal birefringence and polarization maintaining fibers Optical Sources: Basic concepts Einstein relations and population inversion optical feedback and threshold conditions, direct and indirect band gap semiconductors spontaneous and stimulated emission in p-n junction, threshold current density, Hetero junction & DH structure, semiconductor injection lasers structure & Characteristics of injection laser. Drawback and advantages of LED, DH, LED structures and characteristics

Unit-3
Optical detectors: Requirement for photo detections p-n photodiode, characteristics of photo detections, p-i-n and avalanche photodiodes, phototransistors & photoconductors Direct detection receiver performance considerations: Noise sources in optical fiber communication, noise in p-n, p-i-n and APD receivers, Receiver structures. Optical fiber communication systems:

Principal components of an optical fiber communication system, source laminations, optical transmitter circuits, LED and laser drive circuits, optical receiver block diagram, simple circuits for pre-amplifier, automatic gain control and equalization, Regenerative repeater, BER of optical receiver, channel losses, ISI penalty and optical power budgeting for digital optical fiber system, line coding, analog systems,

Unit-4

Optical TDM, SCM, WDM and Hybrid multiplexing methods. Fiber Optic Networks, Transreceivers for Fiber-Optic Networks, Semiconductor Optical Amplifiers, Erbium Doped Fiber Amplifiers (EDFAs), Elements of Architecture of Fiber-Optic

TEXT/REFERENCE BOOKS:

1. Optical fiber Communication: John M.S Senior PHI, 2nd Ed.
2. Optical fiber Communication: G.E. Keiser Mc Graw-Hill, 3rd Ed.
3. Optical Communication: J. Gowar PHI, 2nd Ed.
4. Optoelectronics: Wilson & Hawkes PHI, 2nd Ed.

ECE 015: Analog Signal Processing

LT P: (4-1-0) **Credit: 4**

Unit-1: Liner Analog Functions

Addition, Subtraction, Differentiation, Integration, Impedance Transformation and Conversion

Unit-2: AC/DC Signal Conversion

Signal Rectification, Peak and Valley, Detection, rms to dc Conversion, Amplitude demodulation

Unit-3: Nonlinear Analog Functions

Voltage Comparison, Voltage Limiting (Clipping), Logarithmic Amplifiers, Analog Multipliers, Analog Dividers

Unit-4: Continuous time op-amp RC filters

Second order LP, HP, BP, Notch and AP transfer functions, Kirwin-Huelsman-Newcomb biquad, Ackerberg-Mosberg Circuits, Tow-Thomas biquad, compensated integrators, Sallenkey Circuits, Generalized convertor, GIC biquads.

Unit-5: Transconductance-C filters

Transconductance cells, realization of resistors, integrators, amplifiers, summers and gyrators, first order and second order sections, Ladder design.

TEXT/REFERENCE BOOKS:

1. Ramon Pallas-Areny, John G. Webster, "Analog Signal Processing", John Wiley& Sons

2. R. Schaumann and M. E. Valkenberg, "Design of Analog Circuits", Oxford University Press

ECE 013: Electronic Switching

LT P: (4-1-0) **Credit: 4**

Unit-1: Introduction
Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking, electronic switching, Reed electronic system, digital switching systems.

Unit-2: Digital switching
Switching functions, space division switching, multiple stage switching, nonblocking switches, blocking probabilities, Lee graphs and Jacobaeus, foulded four wire switches, path dinding, switch matrix control; Time division switching, analog and digital time division switching, a digital memory switch, time stage in general, two dimensional switching, implementation complexity of TD switches, multiple stage time and space switching,

STS switching, TST switching, TSSST switches, No.4 ESS Toll switch, System 75 digital PBX, Digital cross connect systems, Consolidation and segregation, DCS hierarchy, integrated cross connect equipment, digital switching in analog environment, zero loss switching.

Unit-3: Telecom Traffic Engineering
Network traffic load and parameters, grade of service and blocking probability, modeling switching systems, Markov processes, birth-death processes, incoming traffic and service time characteristics, Poisson arrival process, holding time of calls, blocking models and loss estimates, lost calls cleared systems with infinite and finite subscribers, lost calls returned systems and lost calls held system, Delay systems and Erlang C formula.

Unit-4: Control of Switching Systems
Call processing functions, sequence of operations, signal exchanges, state transition diagrams; common control, Reliability availability and security; Stored program control, processor architecture, centralized SPC, distributed SPC, Level3, Level2 and Level-1 processing, SPC software, system software and Language processor, SDL, application software.

Unit-5: Signaling
Customer line signaling, AF junctions and trunk circuits, outband and inband signalling, PCM and inter register signaling, Common channel signaling, general principles and network, CCITT signaling system No. 6 and 7, HDLC protocol, Signal units, the signaling information field.
Packet Switching: Packets formats, statistical multiplexing, routing control, dynamic, virtual path circuit and fixed path routing, flow control, X.25 protocol, frame relay, TCP/IP, ATM cell, ATM service categories, ATM switching , ATM memory switch, space memory switch, memory-space, memory-space-memory switch, Banyan network switch.

TEXT/REFERENCE BOOKS:

1. Telecommunication switching System and networks, Thiagarajan Viswanathan, PHI.
2. Telecommunication switching, Traffic and Networks, J.E. Flood, Pearson education.
3. Digital Telephony, J.C. Bellamy, John Wiley, 3rd ed.
4. Principles of Communication Systems, Taub and Schilling, TMH

ECE 011: Microwave Integrated circuits

LT P: (4-1-0) **Credit: 4**

Unit-1: Introduction to transmission lines
Waveguides, strip-lines, micro-strip lines, fin-lines, inverted-strip lines. Reflection coefficient, Transmission coefficient, VSWR, Impedance transformation in RF lossless lines. Impedance measurement. Introduction to multi-port junctions: T-networks, Magic Tee, Directional couplers, Circulators.

Unit-2: Matrix description of multi-port network
Definitions of a multi-port networks; Matrix description of N-port networks; Impedance, Admittance and Scattering matrix of N-port networks, Relations between the matrices of N-port networks. Reciprocal, Loss-less, Symmetrical multi-ports. Properties of Microwave junctions.

Unit-3: Methods of Microwave circuit analysis

Transmission Matrix; Analysis of Cascaded networks; Reciprocity, Lossless-ness and Symmetrical conditions for Microwave 2-port junctions. Elementary 2-port junction, 3-port power dividers- Properties. Even- and odd-mode analysis. Directional Couplers - coupled TEM-Mode transmission lines. Different types of directional couplers. Scattering Matrix of two cascaded multi-ports. Generalized scattering matrix. Signal Flow Graph- Applications. Discontinuities. Modal analysis. Excitation of waveguides.

Unit-4: Impedance matching and tuning

Analytic Solutions, Smith chart solutions; Single-stub tuning – series and shunt tuning, Double-stub tuning, Quarter-wave transformer. Binomial transformer, Chebyshev transformer – Chebyshev polynomials, transformer design. Tapered lines.

Unit-5: Microwave Filters and matching circuits
Periodic structures, Filter design - Image Parameter Method, Insertion Method, Filter Implementation, Couple-line filters, Filters using coupled resonators.

TEXT/REFERENCE BOOKS:

1. Microwave Engineering 3rd Edition, David M Pozar, John Wiley and Sons, 2005
2. Foundation of Microwave Engineering, R E Collin, McGraw Hill International;
3. Microwave Devices & Circuit Design, Ganesh Prasad Srivastava & Vijay Laqxmi Gupta.
4. Measurement & Instrumentation: Trends & Applications. Edited by M K Gosh, S Sen & S Mukhopadhyay, Ane Books India. 2008.

(DE7)

ECE 010: Low Power VLSI Design

LT P: (4-1-0) **Credit: 4**

Unit-1: Introduction

Need for low power VLSI chips, Sources of power dissipation on Digital Integrated circuits. Emerging Low power approaches. Physics of power dissipation in CMOS devices.

Unit-2: Device & Technology Impact on Low Power

Dynamic dissipation in CMOS, Transistor sizing & gate oxide thickness, Impact of technology Scaling, Technology & Device innovation.

Unit-3: Simulation Power analysis:

SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis, data correlation analysis in DSP systems. Monte Carlo simulation. Random logic signals, probability & frequency, probabilistic power analysis techniques, signal entropy.

Unit-4: Low Power Design

Circuit level*:* Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library
Logic level: Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic

Unit-5: Low power Architecture & Systems:

Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, low power arithmetic components, low power memory design. Power dissipation in clock distribution, single driver Vs distributed buffers, Zero skew Vs tolerable skew, chip and package co-design of clock network, Introduction of design flow, algorithmic level analysis and optimization, Architectural level estimation and Synthesis.

TEXT/REFERENCE BOOKS:

1. Gary Yap, Practical Low Power Digital VLSI Design 1997.

2. Kaushik Roy, Sharat Prasad, Low Power CMOS VLSI Circuit Design, 2000

(OE)

OEL 026: Bio-Instrumentation

LT P: (4-1-0) **Credit: 4**

Unit-1: Introduction

Introduction: Introduction of various instrument utilized in Biochemistry, Biomedical and Bioscience laboratories. Basic electronic principles that operate instrument like diode, transistors and their uses in amplifier, operational amplifier and its applications.

Unit-2: Eletrophoretic techniques

General principles, factors affecting migration rate-sample, electrical field, Buffer, voltage and supporting medium. Electrophoresis with paper, cellulose acetate, starch, agar and poly acrylamide, SDS-PAGE, Immunoectrophoresis, Tiselius moving boundary electrophoresis.

Unit-3: Electrochemical Techniques

Principle of Electrophoretic techniques-Reference electrode, measurement of pH by hydrogen and glass electrode, ion - selective electrode and gears sensor. Oxidation-Reduction (Redox) potentials - Principles, potentiometric titration of oxidation-reduction reactions; Redox dyes and

their uses. Oxygen electrode-principles, operation of a Clark electrode, applications of Oxygen electrode.

Unit-4: Approach to Biochemical investigation

Whole animal studies, isotonic salt solution, Osmotic pressure and Osmotic balance, perfusion of isolated organs, tissue slice techniques, methods of using plant and microbial materials, tissue and cell culture-methods of homogenization of tissues and cell fractionation.

Unit-5: Centrifugal techniques

Basic principle of centrifugation. Differential, density gradient, isopycnic and equilibrium centrifugation techniques. Preparative and analytical ultra centrifugation techniques with special reference to determination of molecular weight of macromolecules (derivation included).

TEXT/REFERENCE BOOKS:

1. Practical Clinical Biochemistry - Harold Varley, CBS, New Delhi.
2. Medical Laboratory Technology-Kanai L. Mukherjee, Tata McGraw Hill.
3. Clinical Chemistry- Ranjana Chawla.
4. Laboratory manual in Biochemistry - Jayaraman.
5. Biochemical methods - S.Sadasivan and Manickam.
6. Introduction to Practical Biochemistry - David T. Plummer

B. Tech.

(In all branches)

Department of Humanities

(Management Group)

SYLLABI

(For academic session 2012-13)

Department of Humanities
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Humanities
School:	School of Engineering and Technology
Name of the Course:	B. Tech.
Duration:	Four years
Total number of Credits:	
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. Rakesh Kumar, HOD Chairman 2. Prof. Lallan Prasad, Delhi University Ext. Member 3. Dr. Smita Gupta Int. Member 4. Ms. AnshulChaudhary Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by BOS on 12th July'12 and Faculty Board on 18th July'12

4TH YEAR

HMM 401: Human Resource Management

L T P: 4-0-0 **Credits: 04**

UNIT 1: HRM & Strategic HRM (7)

Meaning and Definition;Nature and Scope; Significance, Functions and objectives; Evolution of the concept of HRM, Contemporary issues in HRM, Environment of HRM;

Organization structure, HRM a staff function and line responsibility, Personnel Policies, Role of personnel manager; HRM and Strategic HRM

UNIT -2 Human Resource Acquisition and Preparation (9)

Human Resource Planning: Definition, Objectives of HRP, Need & Importance of HRP, Process of HRP, Job Analysis & Job Design, Recruitment: techniques and sources, process, Selection procedure, placement, Induction (rules, privileges, responsibilities, accountability) and mentoring,

Training for developing skills & ability to manage people, types of training; on the job & off the job

Unit -3 HR Assessment and Compensation (9)

Performance Appraisal: Meaning, need and purpose, process, methods of performance appraisal, Potential Appraisal, **Job Evaluation**: concepts, objectives, process, Advantages and limitations, methods of job evaluation, **Compensation management**: Introduction and objective of compensation, types of compensation, Incentive & fringe benefits, **Reward & recognition**

Unit -4 Maintaining & Integrating HR (9)

Employee welfare & social security**,** Discipline (code of conduct) & grievance (procedure & methods)**,**Industrial relations & Disputes**,** Trade Union and white collar unions**,** Collective Bargaining and WPM

Unit- 5 Global HRM & Current Trends in HRM (6)

Domestic HRM vs. IHRM, Managing International HR Activities, Expatriate management,

HRIS and e-HRM

References:

- Rao V. S. P., Human Resource Management- text and cases, 2000, Excel Books
- Aswathapa K., Human Resource Management- Text and Cases, 5th edition, 2002,The McGraw Hill
- Lepak David and Mary Gowan, Human Resource Management- managing employees for the competitive advantage, 2009; Perason education
- Rao P. Subba, Essentials of Human Resource Management and Industrial Relations (Text, Cases and Games),3rd edition, 2000, Himalaya Publications
- Singh B. D., Compensation and Reward Management, 1st edition, 2008,Excel books
- Rao P. L., International Human Resource Management- text and cases, 1st edition,2004, Excel Books.
- Cascio Wayne F., Managing Human Resources- productivity, Quality of work life, profits, 2nd edition, 2006,Tata McGraw Hill
- Gupta C. B., Human Resource Management, 8th edition,2003, Sultan Chand Books
- Managing Human Resource, Lallan Prasad & A M Banerjee, Sterling Publication

HMM 402: Sales and Distribution Management

L T P: 4-0-0 **Credits: 4**

UNIT 1: **(8)**

Introduction to sales management and sales organization, Sales function & policies, Personal selling - nature, scope & objectives, Formulating Personal selling strategy, Planning the Sales Effort - Sales planning and Budgeting

UNIT 2: **(8)**

Organizing and directing the sales Force - Recruiting and training sales personnel, Estimating Market Potential and Sales forecasting, Setting the sales territory & quotas, Sales and cost Analysis.

UNIT 3: **(8)**

Designing & compensating sales Personnel, Motivating and Leading the sales force, Evaluating and controlling sales force performance, functions of sales manager

UNIT 4: **(8)**

Distribution Management - Managing marketing logistics & channels, Channel Integration - VMS, HMS, Channel Management, and Marketing channel Policies & legal issue, Logistics of Distribution; Channel Planning, Organisational Patterns in Marketing Channels

UNIT 5: **(8)**

Overview of Marketing Channels, their Structure, Functions and Relationships; Channel Intermediaries - Wholesaling and Retailing;; Managing Marketing Channels; Marketing Channel Policies and Legal Issues; Information System and Channel Management; Assessing Performance of Marketing Channels;

References:

Sales and Distribution Management,Tapan K Panda, Sunil Sahadev, Oxford University Press,2005.

Fundamental of Sales and Distribution, DuttaBholanath, I.K.International Publishing House Pvt Ltd, 2011.

Sales and Distribution Management,Prof. N.H.Mullick,Enkay Publishing House, 2011.

Annexure-XXII-B of Agenda Item no. 6.21

B.Tech.

in

Automobile Engineering

COURSE STRUCTURE & SYLLABI

(Applicable to Students admitted from the AY 2010-11)

Department of Mechanical and Automobile Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Mechanical and Automobile Engineering
School:	School of and Technology
Name of the Course:	B.Tech. in Automobile Engineering
Duration:	Four (04) years
Total Number of Credits:	220
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. G. P. Sinha, HOD, ME&AE, Chairman 2. Prof. D.V. Singh, Fmr. Dir., IIT-R, Ext. Member 3. Prof. S. Prasad, Advisor, GLA Bajaj, Special Invitee 4. Prof. P.K. Sinha, Prof. Emer., ME&AE, Int. Member 5. Prof. R.C. Sachdeva, Dist. ME&AE, Int. Member 6. Prof. Y.V. Satya Kumar, ME&AE, Int. Member 7. Prof. Subhash Kamal, ME&AE, Int. Member 8. Dr. A. Singh, Assoc. Prof., ME&AE, Int. Member 9. Mr. Manish Kr. Yadav, Asst. Prof., Int. Member 10. Mr. Umesh Kr. Jha, Asst. Prof, Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by the BOS and Faculty Board

COURSE STRUCTURE

B.Tech. in Automobile Engineering (ongoing from the Academic year 2010-11)

SEMESTER	Courses (L-T-P)										L. Courses	Contact Hr/Week				Credits
												L	T	P	Total	
V	Industrial Economics & Principles of Management (4-0-0) 4	Mechanical Engineering. Design (3-1-0) 4	Dynamics of Machines (3-1-0) 4	Combustion and Heat Transfer (3-1-0) 4	Department Elective I (4-0-0) 4		Department Elective II (4-0-0) 4	Combustion and Heat Transfer Lab (0-0-2) 2	Dynamics of Machines Lab (0-0-2) 2	Mechanical Engineering Design Lab (0-0-2) 2	**6**	**21**	**3**	**6**	**30**	**27**
VI	Design of Project - Report and Presentation (4-0-0) 4 / Writing for Technical Purpose (4-0-0) 4	Department Elective III (4-0-0)4	Hydraulic and Pneumatic Machines (3-1-0)4	I.C. Engine (3-1-0) 4	Department Elective IV (4-0-0) 4	Open Elective I (3-1-0) 4	I.C. Engine Lab (0-0-2) 2	Automobile Lab (0-0-2) 2	Hydraulic and Pneumatic Machines Lab (0-0-2) 2	**NOTE:** Industrial Training in the Summer after VI Term for 12 Credits	**6**	**21**	**3**	**6**	**30**	**27**
VII	Professional Competence Development Programme (4-0-0) 4	Department Elective V (4-0-0)4	Automotive Aerodynamics (3-1-0) 4	Automotive Air Condition-ing (3-1-0) 4	Department Elective VI (4-0-0) 4	Open Elective II (4-0-0) 4	Automotive Air Conditioning Lab (0-0-2) 2	Automotive Aerodynamic Lab (0-0-2) 2	Seminar 4 Credits		**6**	**22**	**2**	**4**	**28**	**30**
VIII	Project Risk Management (4-0-0) 4	Department Elective VII (4-0-0) 4	Department Elective VIII (4-0-0) 4	Open Elective III (4-0-0) 4	Project 8 Credits						**4**	**16**			**16**	**24**

Note: 1) Industrial Training is for 12 Credits. 2) No of Contact Hours for Seminar & Project, will be decided/notified by Dept. **Total Credits: 220**
3) In the Tabulation above, for each subject, above (L-T-P) X, X refers to the no of contact hours for each subject

COURSE STRUCTURE

Level III/Term V

S. No.	SUBJECT CODE	TITLE OF PAPER	HOURS				CREDITS
	THEORY		L	T	P	TOTAL	
1	HMM	Industrial Economics & Principles of Management	4	-	-	4	4
2	MEC-303	Mechanical Engineering Design	3	1	-	4	4
3	MEC-301	Dynamics of Machines	3	1	-	4	4
4	AUT-302	Combustion & Heat Transfer	3	1	-	4	4
5	AUT-306	Department Elective I	4	-	-	4	4
6	AUT-307	Department Elective II	4	-	-	4	4
PRACTICAL							
1	MEC-353	Mechanical Engineering Design Lab	-	-	2	2	1
2	MEC-351	Dynamics of Machines Lab	-	-	2	2	1
3	AUT-352	Combustion & Heat Transfer Lab	-	-	2	2	1
TOTAL			**21**	**3**	**6**	**30**	**27**

Level III/Term VI

S. No.	SUBJECT CODE	TITLE OF PAPER	HOURS				CREDITS
	THEORY		L	T	P	TOTAL	
1	PCM	Design of Project: Report and Presentation	4	-	-	4	4
	PCM-301	Writing for Technical Purpose	4	-	-	4	4
2	AUT-308	Department Elective III	4	-	-	4	4
3	AUT-304	Hydraulic and Pneumatic Machines	3	1	-	4	4
4	AUT-309	Department Elective IV	4	-	-	4	4
5		Open Elective I	3	1	-	4	4
6	MEC-305	I.C. Engine	3	1	-	4	4
PRACTICAL							
1	AU-354	Hydraulic and Pneumatic Machines Lab	-	-	2	2	1
2	MEC-355	I.C. Engine Lab	-	-	2	2	1
	AUT	Automobile Lab	-	-	2	2	1
TOTAL			**21**	**3**	**6**	**30**	**27**

Level IV/Term VII

S. No.	SUBJECT CODE	TITLE OF PAPER	HOURS				CREDITS
	THEORY		L	T	P	TOTAL	
1	HMM/ PCM	Professional Competence Development Programme	2	-	4	6	4
2	AUT-402	Automotive Aerodynamics	3	1	-	4	4
3	AUT-401	Automotive Air Conditioning	3	1	-	4	4
4	AUT-404	Department Elective V	4	-	-	4	4
5	AUT-405	Department Elective VI	4	-	-	4	4
6		Open Elective II	4	-	-	4	4
PRACTICAL							
1	AUT-452	Automotive Aerodynamics Lab	-	-	2	2	1
2	AUT-451	Automotive Air Conditioning Lab	-	-	2	2	1
3	AUT-403	Seminar	-	-	-	-	4
TOTAL			**20**	**2**	**8**	**30**	**30**

Level IV/Term VIII

S. No.	SUBJECT CODE	TITLE OF PAPER	HOURS				CREDITS
	THEORY		L	T	P	TOTAL	
1	HMM	Project Risk Management	4	-	-	4	4
2	AUT-406	Department Elective VII	4	-	-	4	4
3	AUT-407	Department Elective VIII	4	-	-	4	4
4		Open Elective III	4	-	-	4	4
PRACTICAL							
1	AUT-408	Project	-	-	-	-	8
TOTAL			**16**	**-**	**-**	**16**	**24**

Contact Hours:

L- Lecture
T- Tutorial
P- Practical

B.Tech.

in

Automobile Engineering

(with effect from academic session 2010-11)

SYLLABI

Department

Core Subjects

MEC-303: MECHANICAL ENGINEERING DESIGN

L T P: 3 1 2 **Credits: 5**

UNIT-1: **(8)**

Introduction and Design against Static Load: Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure

Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads.

UNIT-2: **(8)**

Shafts: Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments.

Keys and Couplings: Types of keys, splines, Selection of square & flat keys, Strength of sunk key.

UNIT-3: **(8)**

Design against Fluctuating Loads: Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Solderberg, Goodman & Gerber criteria , Shafts subjected to fatigue loads, Design for rigidity.

Riveted Joints-Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint

Couplings-Design of rigid and flexible couplings

UNIT-4: **(8)**

Mechanical Springs: Types, Material for helical springs, End connections for compression and tension helical springs, stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading

Power Screws: Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack

UNIT -5: **(8)**

Sliding Contact Bearing: Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

Rolling Contact Bearing: Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing

Text Books and References:

1. Mechanical Engineering Design: Joseph E. Shigley, Charles R. Misdla, Tata McGraw Hill.
2. Design of Machine Elements: V.B. Bhandari, Tata McGraw Hill.

MEC-301: DYNAMICS OF MACHINES

L T P: 3 1 2 **Credits: 5**

UNIT-1: **(10)**

Static & Dynamic Force Analysis: Static equilibrium of two/three force members, Static equilibrium of member with two forces and torque, Static force analysis of linkages, D'Alembert's principle, Equivalent offset inertia force, Dynamic force analysis of four link mechanism and slider crank mechanism, Engine force analysis-Piston and crank effort.

Turning Moment & Flywheel: Turning moment on crankshaft, Turning moment diagrams-single cylinder double acting steam engine, four stroke IC engine and multi-cylinder steam engine, Fluctuation of energy, Flywheel

UNIT-2: **(10)**

Balancing of Machines: Static and dynamic balancing, Balancing of several masses in the same plane and different planes, Balancing of reciprocating masses, Balancing of primary force in reciprocating engine, Partial balancing of two cylinder locomotives, Variation of tractive force, swaying couple, hammer blow**.**

UNIT-3: **(10)**

Governors: Terminology, Centrifugal governors-Watt governor, Dead weight governors-Porter & Proell governor, Spring controlled governor-Hartnell governor, Sensitivity, stability, Hunting, Isochronism, Effort and Power of governor, Controlling force diagrams for Porter governor and Spring controlled governors

UNIT-4: **(10)**

Gyroscopic Motion: Principles, Gyroscopic torque, Effect of gyroscopic couple on the stability of aero planes & automobiles.

Mechanical Vibrations: Types of vibrations, Degrees of freedom, Single degree free & damped vibrations, Forced vibration of single degree system under harmonic excitation, Critical speeds of shaft.

Textbooks and References:

1. Theory of Machines, Thomas Bevan
2. Theory of Machines and Mechanisms, Shigley
3. Theory of Machines and Mechanisms, Ghosh & Mallik
4. Theory of Machines and Mechanisms, Rao & Dukkipati
5. Theory of Machines, S.S. Rattan
6. Theory of Machines, R.K. Bansal
7. Mechanics of Machines, V. Ramamurti
8. Theory of Machines, Khurmi & Gupta
9. Theory of Machines, P.L. Ballaney
10. Theory of Machines, V. P. Singh

AUT-302: COMBUSTION AND HEAT TRANSFER

L T P: 3 1 0 **Credits: 4**

UNIT- 1: **(8)**

Combustion: Combustion phenomena of S.I. and C.I. engines,Stages of combustion Photographic studies of combustion process- p-q diagrams in S.I. and CI engines.Abnormal combustion -Effect of engine variables on knock-Factors controlling combustion chamber design. Combustion chambers: Diesel engine combustion chambers open, Divided, Swirl, Turbulent and Ricardo's M Combustion chambers, Homogeneous combustion engine.

UNIT- 2: **(8)**

Introduction to heat transfer: Temperature, Heat and thermal equilibrium, Modes of basic laws of heat transfer i.e. conduction, Convection and Radiations; Fourier equation and Thermal Conductivity, Derivation of the general form of heat conduction equation in Cartesian, Cylindrical Spherical Coordinates

UNIT- 3: **(8)**

Conduction Heat Transfer: Steady State Conduction, Heat conduction through plane wall, Composite wall, cylindrical wall, Multi layer cylindrical wall, and through spheres; effect of variable conductivity, Critical thickness of Insulation; conduction with heat generation, plane wall with uniform heat generation, Dielectric heating, Cylinder with uniform heat generation, Heat transfer through Piston crown. Heat transfer from extendedsurface, steady flow of heat along a rod, Governing differential equation and its solution, Heat dissipation from and infinitely long fin, Fin performance.

Convection Heat Transfer: Free and forced convection,Laminar and Turbulent flow, Newton Rekhman Law: Convection rate equation, Nusselt Number; radiation heat exchanger; salient features and characteristics of radiation, Absorptive, reflectivity and transmittance; spectral and spatial energy distribution, wavelength distribution of black body radiation, Plank's law; total emissive power: Stefan Boltzman law,Wien's displacement law, Kirchoffs Law, gray body and selective emitters.

UNIT-4: **(8)**

Heat Transfer in IC Engines: Heat transfer,Temperature distribution and thermal stress in Piston, Cylinder Liner, cylinder head, Fins and valves. Variation of gas temperatures, Heat transfer coefficient and combustion system-Effect of engine load on piston temperature heat rejected to coolant quantity of water required.

UNIT- 5: **(8)**

Measurements Flow meters-Volumetric type, gravimetric type-fuel consumption measurement in vehicles-Air consumption: Air box method,viscous air flow meter,flame temperature measurement and pressure measurement.

Text Books:

1. Fundamentals of Heat and Mass Transfer, F.P. Incropera and D.P. Dewitt, 4th edition, John Wiley & Sons
2. Heat Transfer, J.P.Holman, 8th edition, Mc Graw Hill

Reference Books:

1. Heat Transfer, Long, Pearson Education
2. Principles of Heat Transfer, Kreith , Asian Books/Thompson

AUT-304: HYDRAULIC AND PNEUMATIC MACHINES

L T P: 3 1 0 **Credits: 4**

UNIT-1: Fluid Power Systems and Fundamentals (8)

Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Properties of hydraulic fluids – General types of fluids – Fluid power symbols. Basics of Hydraulics-Applications of Pascals Law- Laminar and Turbulent flow – Reynold's number – Darcy's equation – Losses in pipe, valves and fittings.-

UNIT-2: Hydraulic System and Components (8)

Sources of Hydraulic Power: Pumping theory – Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump performance – Variable displacement pumps. Fluid Power Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tanden, Rodless, Telescopic, Cushioning mechanism, Construction of double acting cylinder, Rotary actuators – Fluid motors, Gear, Vane and Piston motors.

UNIT-3: Design of Hydraulic Circuits (8)

Construction of Control Components : Directional control valve – 3/2 way valve – 4/2 way valve – Shuttle valve – check valve – pressure control valve – pressure reducing valve, sequence valve, Flow control valve – Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram. Accumulators and Intensifiers: Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier – Intensifier circuit.

UNIT-4: Pneumatic Systems and Components (8)

Pneumatic Components: Properties of air – Compressors – Filter, Regulator, Lubricator Unit – Air control valves, Quick exhaust valves, pneumatic actuators. Fluid Power Circuit Design, Speed control circuits, synchronizing circuit, Penumo hydraulic circuit, Sequential circuit design for simple applications using cascade method.

UNIT-5: Design of Pneumatic Circuits (8)

Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves. Fluidics – Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits, ladder diagrams, PLC applications in fluid power control. Fluid power circuits; failure and troubleshooting.

Text Books:

1. Anthony Esposito, "Fluid Power with Applications", Pearson Education 2005.
2. Majumdar S.R., "Oil Hydraulics Systems- Principles and Maintenance", Tata McGraw-Hill, 2001.

Reference Books:

1. Srinivasan.R, “Hydraulic and Pneumatic controls”, Vijay Nicole, 2006.
2. Shanmugasundaram.K, “Hydraulic and Pneumatic controls”, Chand & Co, 2006.
3. Majumdar S.R., “Pneumatic systems – Principles and maintenance”, Tata McGraw Hill, 1995
4. Anthony Lal, “Oil hydraulics in the service of industry”, Allied publishers, 1982.
5. Harry L. Stevart D.B, “Practical guide to fluid power”, Taraoeala sons and Port Ltd.

MEC-305: I.C. ENGINES

L T P: 3 1 2 **Credits: 5**

UNIT-1: **(8)**

Introduction to I.C Engines: Engine classification, Air standard cycles, Otto, Diesel, Stirling, Ericsson cycles, Actual cycle analysis, Two and four stroke engines, SI and CI engines, Valve timing diagram, Rotary engines, stratified charge engine.

Fuels: Fuels for SI and CI engine , important qualities of SI engine fuels, Rating of SI engine fuels, Important qualities of CI engine fuels, Dopes, Additives, Gaseous fuels, LPG, CNG, Biogas, Producer gas, Alternative fuels for IC engines.

UNIT–2: **(8)**

SI Engines: Carburetion, Mixture requirements, Carburetor types Theory of carburetor, MPFI. Combustion in SI engine, Flame speed, Ignition delay, Abnormal combustion and it's control, combustion chamber design for SI engines. Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition.

UNIT–3: **(8)**

CI Engines: Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings. Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI Engines. Scavenging in 2 Stroke engines, pollution and it's control.

UNIT-4: **(8)**

Engine Cooling: Different cooling systems, Radiators and cooling fans.

Lubrication: Engine friction, Lubrication principal, Type of lubrication, Lubrication oils, Crankcase ventilation.

Supercharging: Effect of altitude on power output, Types of supercharging.

Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines.

UNIT-5: **(8)**

Recent Developments: Supercharging and Turbocharging, Electronic Control, Rotary Engine.

Textbooks and References:

1. Fundamentals of Internal Combustion Engine by Gill, Smith,Ziurs, Oxford & IBH Publishing COIC Engines, by Rogowsky, international Book Co.
2. A Course in International Combustion Engines, by Mathur & Sharma, Dhanpat Rai & Sons.
3. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications Czechoslovakia
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by Ganeshan, Tata Mc Graw Hill Publishers.
   I.C Engine, by R. Yadav, Central Publishing House, Allahabad.

AUT-401: AUTOMOTIVE AIR-CONDITIONING

L T P: 3 1 0 **Credits: 5**

UNIT-1: **(10)**

Refrigeration: Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle: Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).

UNIT-2: **(10)**

Vapour Compression System: Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system

requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

UNIT-3: **(10)**

Air Conditioning: Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP).

Load calculation of automotive vehicles.

UNIT-4: **(10)**

Refrigeration Equipment & Application: Elementary knowledge of refrigeration & air conditioning equipments e.g compressors, condensers, evaporators & expansion devices, Air washers, Cooling, towers & humidifying efficiency, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

Textbooks and References:

1. Refrigeration and Air conditioning, Manohar Prasad, New Age International (P) Ltd. Pub.
2. Refrigeration and Air conditioning, C.P Arora.
3. Refrigeration and Air conditioning, Arora & Domkundwar.
4. Refrigeration and Air conditioning, Stoecker & Jones.
5. Refrigeration and Air conditioning, Roy J. Dossat.
6. Refrigeration and Air conditioning, P.L. Baloney.
7. Thermal Environment Engg., Kuhen, Ramsey & Thelked.

AUT-402: AUTOMOTIVE AERODYNAMICS

L T P: 3 1 0 **Credits: 5**

UNIT-1: Review of Basic Fluid Mechanics **(8)**
Continuity, momentum and energy equations.

UNIT-2: Two Dimensional Flows **(8)**
Basic flows – Source, Sink, Free and Forced vortex, uniform parallel flow. Their combinations, Pressure and velocity distributions on bodies with and without circulation in ideal and real fluid flows. Kutta Joukowski's theorem.

UNIT-3: Conformal Transformation **(8)**
Joukowski transformation and its application to fluid flow problems, Kutta condition, Blasius theorem.

UNIT-4: Airfoil And Wing Theory **(8)**
Joukowski, Karman - Trefftz, Profiles - Thin aerofoil theory and its applications. Vortex line, Horse shoe vortex, Biot and Savart law, Lifting line theory and its limitations.

UNIT-5: Viscous Flow **(8)**
Newton's law of viscosity, Boundary Layer, Navier-Stokes equation, displacement, Momentum thickness, Flow over a flat plate, Blasins solution.

Text Books:
1. Anderson, J.D., "Fundamentals of Aerodynamics", McGraw-Hill Book Co., New York, 1985.

Reference Books:
1. Houghton, E.L., and Carruthers, N.B., "Aerodynamics for Engineering students", Edward Arnold Publishers Ltd., London, 1989.
2. Milne Thomson, L.H., "Theoretical aerodynamics", Macmillan, 1985.
3. Clancey, L.J., "Aerodynamics", Pitman, 1986.

Department Electives

Pl Note: The list of Subjects categorized under Groups of Department Elective-I, II, III, IV, V, VI, VII and VIII is a general categorization. A student can opt for any eight Department Electives chosen from any eight Groups as per his/her choice and aptitude.

ADVANCED MANUFACTURING PROCESSES

L T P: 4 0 0 **Credits: 4**

UNIT-1: Advanced Machining Processes (14)

Process principle, Material removal mechanism, Parametric analysis and applications of processes such as ultrasonic machining (USM), Abrasive jet machining (AJM), Water jet machining (WJM), Abrasive water jet machining (AWJM), Electrochemical machining (ECM), Electro discharge machining (EDM), Electron beam machining (EBM), Laser beam machining (LBM) processes.

UNIT-2: (12)

Advanced Casting Processes

Metal mould casting, Continuous casting, Squeeze casting, Vacuum mould casting, Evaporative pattern casting, Ceramic shell casting

UNIT-3: (12)

Advanced Welding Processes

Details of electron beam welding (EBW), laser beam welding (LBW), ultrasonic welding (USW),

UNIT-4: (12)

Advanced Metal Forming Processes

Details of high energy rate forming (HERF) process, Electro-magnetic forming, explosive forming, Electro-hydraulic forming, Stretch forming, Contour roll forming

Text Books:

1. "Nontraditional Manufacturing Processes", G.F. Benedict, Marcel Dekker, Inc. New York.

References Books:

1. "Materials and Processes in Manufacturing" (8th Edition), E. P. DeGarmo, J. T Black, R. A. Kohser, Prentice Hall of India, New Delhi
2. "Manufacturing Science" A. Ghosh, and A. K. Mallik, Affiliated East-West Press Pvt. Ltd. New Delhi.

MODERN VEHICLE TECHNOLOGY

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Trends in Automotive Power Plants:– Stratified charged / lean burn engines – Hydrogen Engines-battery vehicles – Electric propulsion with cables – Hybrid Vehicles ,Magnetic track vehicles.

UNIT-2: **(10)**

Suspension, Brakes and Safety: Air suspension-Closed loop suspension-antiskid braking system, Retarders, Regenerative braking, safety-cage, air-bags-crash resistance – passenger comfort.

UNIT-3: **(10)**

Noise and Pollution: Reduction of noise – Internal and external pollution control through alternate fuels/ power plants-Catalytic converters and particle filters for particular emission.

UNIT-4: **(10)**

Vehicle Operation and Control: , GPS navigation control, Computer Control for pollution and noise and for fuel economy-Transducers and operation of the vehicle like optimum speed and direction.

UNIT-5: **(10)**

Intelligent Highway system-Satellite control of vehicle operation for safe and fast travel. Electronic Stability Control

Text Books:

1. Automotive Mechanic, N.K Giri, Khanna Publishers, Delhi, 8th Edition
2. Motor Vehicles, Newtons, Steed Garrat 13th edition, Butterworthy London.

Reference Books:

1 Beranek. L.L. Noise Reduction, McGraw-Hill Book Co., Inc, Newyork, 1993
2. Bosch Hand Book, 3rd Edition, SAE,1993

COMPUTER INTEGRATED MANUFACTURING

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Concept of Computer Integrated Manufacturing (CIM); Basic components of CIM; Distributed database system; distributed communication system, computer networks for manufacturing; future automated factory; social and economic factors.

UNIT-2: **(10)**

Computer Aided Design (CAD): CAD hardware and software; product modelling, automatic drafting; engineering analysis; FEM design review and evaluation; Group Technology Centre.

UNIT-3: **(10)**

Computer Aided Manufacturing (CAM): Computer assisted NC part programming; Computer assisted robot programming; computer aided process planning (CAPP);

UNIT-4: **(10)**

computer aided material requirements planning (MRP); computer aided production scheduling; computer aided inspection planning; computer aided inventory planning;

UNIT-5: **(10)**

Flexible manufacturing system (FMS); concept of flexible manufacturing; Integrating NC machines, robots, AGVs, and other NC equipment; Computer aided quality control; business functions, computer aided forecasting.Management Information Systems (MIS), Various CIM systems - examples.

Text Books:

1. CAD, CAM, CIM by P.Radhakrishnan and S.Subramanyan, New Age International Publishers.
2. Automation, Production Systems and Computer Integrated Manufacturing by M. P. Groover, Prentice Hall.

Reference Books:

1. Computer Integrated Manufacturing by Paul G. Rankey, Prentice Hall.
2. Computer Integrated Manufacturing by Harrington J. Jr., Industrial Press, Inc., New York.
3. Computer Integrated Manufacturing by K.Rathmill and P.Macconal, IFS Publications.

ADVANCES IN MATERIAL PROCESSING

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction to advanced materials: composites, ceramics, refractory metals and alloys, super alloys;

UNIT-2: **(10)**

Solidification processing: principles of solidification, processing and applications of recent solidification techniques like infiltration techniques, rheocasting, squeeze casting, compocasting, rapid solidification techniques and zone refining;

UNIT-3: **(10)**

Powder metallurgy processing: Metal and ceramic powder production, characterisation, mixing techniques; Mechanical alloying and process variables; Various compaction techniques and the process variables

UNIT-4: **(10)**

Mechanism of sintering and various sintering techniques, viz., solid state sintering, liquid phase sintering, reaction sintering, hot pressing, HIP and self propagating combustion sintering; Recent advances in powder metallurgy like Ospray and Deposition techniques.

UNIT-5: **(10)**

Ultra light Materials and Metallic Foams Material Definition and Processing Characterization of cellular metals Material properties Bio-Materials Classes of materials used in medicine Application of materials in medicine and dentistry Various materials and coatings for implants
Composite Materials: Material Definition and classifications Material properties and applications

Text Books:

1. Rapidly Solidified Metals by T.R. Anantharaman and C. Suryanarayana, Trans. Tech Publications.
2. Handbook of Cellular metals, Production, processing, Application, Edited by Hans Peter Degischer and Brigitte Kriszt, Wiley - VCH, 2002

Reference Books:

1. Fundamentals of Solidification by W.Kurtz and D.J.Fisher, Trans. Tech Publication.
2. Modern Ceramic Engineering by D.W.Richardson, Marcel Dekker Inc..

TRIBOLOGY AND TEROTECHNOLOGY

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction to tribological systems and their characteristic features: Physico-mechanical interactions at interfacial contact surfaces; Analysis and assessment of topography;

UNIT-2: **(10)**

Deterministic and stochastic tribo- models for asperity contact, frictional resistance and wear; Frictional instability and stick-slip phenomenon; Models of aheso-diffusion wear process;

UNIT-3: **(10)**

Kinetics of solid state interfacial interactions. Principles of lubrication: Hydro-dynamic, hydro-static, elatso-hydrodynamic cases; Boundary film lubrication; Solid lubricants; Tribological design of machine elements and systems; Principles of life-cycle analysis and their application.

UNIT-4: **(10)**

Terotechnology: Introduction, Life cycle cost analysis of plants and concept of tero-technology; Various maintenance management strategies; Production maintenance interface and terotechnology based planning and control

UNIT-5: **(10)**

Maintenance policy determination; Fixed time replacement prior to failure; Concept of health and usage monitoring of plants (HUM); Condition based maintenance; Opportunity maintenance; Design out maintenance; Preventive maintenance; Reliability, maintainability and availability of plants and equipments; Replacement strategies, Computer application in terotechnology based critical analyses.

Text Books:

1. Tribology - a System Approah to the Science and Technology of Friction, Lubrication and Wear by Horst Czichos, Elsevier Scientific Publishing Co.

Reference Books:

1. Principles of Tribology by Halling J. (Editor), Macmillan, London.
2. Handbook of Tribology: Materials, Coatings and Surface Treatments by Bharath Bhooshan and B. K. Gupta, McGrawhill, New York.

ROBOTICS AND ROBOT APPLICATIONS

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Robot definition: Robotic systems - Its role in automated manufacturing; robot anatomy; robot classifications and specifications.

UNIT-2: **(10)**

Robot kinematics, forward and reverse transformation, homogeneous transformations. Robot actuators and control; Pneumatic, hydraulic and electrical drives and controls used in robots.

UNIT-3: **(10)**

Robot end-effectors, mechanical, magnetic and vacuum grippers, gripping forces RCC and design features of grippers.

UNIT-4: **(10)**

Robot sensors, different types of contact and non-contact sensors; Robot vision and their interfaces;

UNIT-5: **(10)**

Application of Robots: Industrial Robots, Application of Robots in Medical science and exploration, Military robots, Artificial intelligence, humanoid robots, End Effectors, Specifications of robots

Text Books:

1. Robotics for Engineers by Y. Koren, McGrawhill.
2. Robotics Technologies and Flexible Automation by S. R. Deb, TMH.

Reference Books:

1. Industrial Robotic Technology - Programming and Application by M.P.Groover et. al., McGrawHill
2. Robots Modelling Control and Applications with Software by P.G.Ranky and C.Y.Ho, Springer Verlag Berlin.

OPTIMISATION FOR ENGINEERING DESIGN

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Single Variable Optimization for engineering design: Introduction-Engineering optimization problems-Optimality criteria-Bracketing methods-Region elimination methods-Point estimation metho0ds-Gradient based methods-Root finding using optimization techniques Computer programmes.

UNIT-2: **(10)**

Multi Variable Optimization Algorithm: Optimality criteria-Unidirectional search-Direct search methods-gradient based methods Computer programmes.

UNIT-3: **(10)**

Constrained Optimization Algorithms: Kuhn – Tucker conditions –Transformation methods – sensitivity analysis – Direct search for constrained minimization-Unearized

UNIT-4: **(10)**

search techniques – feasible direct method-generalised reduction gradient method-Gradient projectionmethod- Computer programmes. Specialized Algorithms : Integer programming – Geometric programming.

UNIT-5: **(10)**

Non-Traditional Optimization Algorithms: Genetic algorithms – Simulated annealing – Global optimization – Computer programmes.

Text Books:

1.Rao.S.S., Optimisation Theory and Application, Wiley Eastern, New Delhi, 1990

Reference Books:

1. Kalyanmay Deb, Optimization for Engineering Design, Prentice Hall of India, New Delhi.
2. Taha. M.A., Operations Research, Macmillan, New York, 1989
3. Muirthy, Linear Programming, Wiley, New York, 1987.
4. Rekiaaitis. G.V. Ravindran.A. And Regedell K.M., Engineering optimization methods and applications, Wiley, New York, 1986.
5. Conley. W., Computer Optimization Techniques, Pntrecelli Book, 1980.

AUT001: TRACTORS AND FARM EQUIPMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

General Design of Tractors : Classification of Tractors-Main components of Tractor-Safety Rules.

UNIT-2: **(10)**

Control of the Tractor and Fundamentals of Engine Operation: Tractor controls and the starting of the tractor engines-Basic notions and definition-Engine cycles-Operation of multi cylinder engines-General engine design - Basic engine performance characteristics.

UNIT-3: **(10)**

Engine Frame Work and Valve Mechanism of Tractor: Cylinder and pistons-Connecting rods and crankshafts Engine balancing – Construction and operation of the valve mechanism-Valve mechanism components – Valve mechanism troubles.

UNIT-4: **(10)**

Cooling system, Lubrication System and Fuel System of a Tractor: Cooling system – Classification – Liquid cooling system – Components, Lubricating system servicing and troubles – Air cleaner and turbo charger – Fuel tanks and filters –Fuel pumps.

UNIT-5: **(10)**

Farm Equipments: Working attachment of tractors-Farm equipment – Classification – Auxiliary equipment – Trailers and body tipping mechanism.

Text Books:

1. Rodichev and G.Rodicheva, Tractor and Automobiles, MIR Publishers, 1987

Reference Books:

1. Kolchin. A., and V.Demidov Design of Automotive engines for tractor, MIR Publishers, 1972

SIMULATION OF IC ENGINES PROCESSES

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction: Introduction-Heat of reaction-Measurement of URP-Measurement of HRP-Adiabatic flame temperature: Complete combustion in C/H/O/N Systems, Constant volume adiabatic combustion, constant pressure adiabatic combustion. Calculation of adiabatic flame temperature-Isentropic changes of state SI Engine Simulation with Air as working medium

UNIT-2: **(10)**

Deviation between actual and ideal cycle-Problems, I engine simulation with adiabatic combustion, temperature drop due to fuel vaporisation, full throttle operation-efficiency calculation, part-throttle operation, super charged operation

UNIT-3: **(10)**

Progressive Combustion: SI Engines simulation with progressive combustion with gas exchange process, Heat transfer process, friction calculation, compression of simulated values

UNIT-4: **(10)**

validation of the computer code, engine performance simulation, pressure crank angle diagram and other engine performance. Simulation of 2-Stroke SI Engine: Diesel Engine

UNIT-5: **(10)**

Simulation: Multi Zone model for combustion, different heat transfer models, equilibrium calculations, simulation of engine performance, simulation for pollution estimation.

Text Books:

1. Ganesan. V. Computer Simulation of spark ignition engine process, Universities Press (I) Ltd. Hyderabad, 1996.

Reference Books:

1. Ramoss. A.L., Modelling of Internal Combustion Engines Processes, McGraw Hill Publishing Co., 1992.
2. Ashley Campbel, Thermodynamic analysis of combustion engines, John Wiley & Sons, New York, 1986
3. Benson. R.S., Whitehouse. N.D., Internal Combustion Engines, Pergamon Press, Oxford, 1979.

NON-DESTRUCTIVE TESTING

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction (10)

Scope and advantages of NDT. Comparison of NDT with DT. Some common NDT methods used since ages, Terminology. Flaws and Defects, Visual inspection, Equipment used for visual inspection. Ringing test chalk test (oil whitening test). Attractive uses of above tests in detecting surface cracks, bond strength & surface defects.

UNIT-2: Common NDT Methods (10)

Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrant and developers. Illustrative examples – Heavy castings of large size, frame of jet engine, porosity testing of nickel alloys, leak testing. Zyglo test **Magnetic particle Inspection**– Scope, principle, Ferro Magnetic and Non-ferro magnetic materials, equipment & testing. Advantages, limitations Interpretation of results. DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.

UNIT-3: Radiographic Methods (10)

X-ray radiography principle, equipment & methodology. Applicability, types of radiations, limitations. Interpretation of Radiographs, limitations of y-ray radiography – principle, equipment. Attenuation of electro magnetic radiations, source of radioactive materials & technique. Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (Incoherent scattering). Pair production, Beam geometry, Scattering factor. Advantages of y-ray radiography over X-ray radiography Precautions against radiation hazards. Case Study — X-ray of human body.

UNIT-4: Ultrasonic Testing Methods (10)

Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques, advantages, Limitation & typical applications. Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. Case Study– Ultrasonography of human body.

UNIT-5: Eddy Current Inspection (10)

Principle, Methods, Advantages, Scope and limitations. Types of Probes. Case Studies.

Text Books:

1. ASM Handbook Vol. 11,8th Edition – Non-destructive Testing & Evaluation
2. Research Techniques in NDT Vol.3, R.S. Shah, Academic

Reference Books:

1. Bray, Don E. and Stanley, Roderic K., Nondestructive Evaluation: A Tool in Design, Manufacturing, and Service. Revised Edition 1997, CRC Press New York.

MEC006: INDUSTRIAL ENGINEERING

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Productivity: Introduction, definition, measurement, productivity index, ways to improve productivity, Types of Production System.

Work study: Meaning and benefits of work study, time & motion study. Micromotion study P.M.T.S. man machine Diagram flow chart. Motion economy, Method study, work measurement, work sampling, standard time.

UNIT-2: **(10)**

Plant layout and materials Handling: Plant location, type of layout, principles of facility layout principles of material handling, Material Handling eqpts.

Production planning and control: Objectives, Forecasting, product design and development functions, steps in PPC. Planning routine, scheduling, Dispatching & follow-up, Effectiveness of PPC, Introduction of JIT.

UNIT-3: **(10)**

Managerial Economics: Introduction, Assumptions, Time Value of money, apprised, criteria step-in BEA, purpose, costs & overheads fixed & variable costs, margin of safety, Angle of incidence profit volume graph.

Replacement Analysis: Depreciation causes, obsolescence, service life of assets, Replacement of items.

Maintenance Management: Maintenance Planning & Control, Maintenance Strategy

UNIT-4: **(10)**

Inventory Control: Inventory, function, cost, deterministic models, Introduction to MRP, supply chain Management

Quality Control: Introduction, process control, SQC control Charts, Single double & sequential sampling, Introduction to TQM & bench marking.

UNIT-5: **(10)**

Supply Chain Management and Decision Support System: MRP, ERP, Modern Supply Chain

Manpower Planning: Resources, Human relationship.

Job Evaluation & Merit rating: Job analysis, Job description job simplification and job evaluation methods & description, merit rating, wage incentive plans.

Text Books:

1. Industrial Engineering, Ravi Shanker.
2. Industrial Engineering, Mahajan.

Reference Books:

1. Principles of Management. An analysis of Management Functions, H.Koontz & C.O. Donnel. Tata McGraw-Hall Co.
2. Manufacturing Management, J Moore Prentice Hall Englewoon Cliffs New Jersey.
3. Modern Production Operations Management, Buffa E.S. Wiley Eastern.
4. Industrial Engg. & Management O.P. Khanna.

ALTERNATE FUELS AND ENERGY SYSTEMS

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction **(10)**

Estimation of petroleum reserve-Need for alternate fuel-Availability and properties of alternate fuels-general use of alcohols LPG-Hydrogen-Ammonia, CNG, and
LNG-Vegetable oils and Biogas-Merits and demerits of various alternate fuels.

UNIT-2: Alcohols: **(10)**

Properties as engine fuels, alcohols and gasoline blends-Combustion characteristics in engines-emission characteristics. Natural Gas, LPG, Hydrogen and Biogas: Availability of CNG, properties modification required to use in engines-performance and emission characteristics of CNG using LPG in SI & CI engines.

UNIT-3: **(10)**

Performance and emission for LPG-Hydrogen-Storage and handling, performance and safety aspects.

UNIT-4: Vegetable Oils: **(10)**

Various vegetable oils for engines-Esterification-Performance in engines-Performance and emission characteristics.

UNIT-5: Electrical and Solar Powered Vehicles: **(10)**

Layout of an electric vehicle Advantage and limitations-Specifications-System component, Electronic control system-High energy and power density batteries-Hybrid vehicle-Solar powered vehicles

Text Books:

1. Maheswar Dayal, Energy today & tomorrow, I & B Horishr India,1982

Reference Books:

1. Nagpal, Power Plant Engineering, Khanna Publishers,1991.
2. Alchohols and Motor fuels progress in technology, Series No.19,SAEPublicartion USA 1980.
3. SAE paper Nos.840367, 841156,841333,841334.
4. The properties and performance of modern alternate fuels SAE paper No 841210.
5. Bechtold.R.L. Alternative Fuels Guide Book, SAE, 1997.

MICROPROCESSOR APPLICATION IN AUTOMOBILES

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Architecture: General 8 bit microprocessor and its architecture 8085,Z-80 and MC 6800 MPU and its pin functions-Architecture-Functions of different sections.

UNIT-2: **(10)**

Instruction Set: Instruction format-addressing modes-instruction set of 8085 MPU-T-STATE-Machine cycle and instruction cycles-Timing diagrams-Different machine cycles-Fetch and execute operations-estimation of execution times.

UNIT-3: **(10)**

Assembly Language Programming: Construct of the language programming-Assembly format of 8085-Assembly Directive-Multiple precision addition and subtraction-BCD to Binary and Binary to BCD Multiplication, Division, Code conversion using look up tables-stack and subroutines.

UNIT-4: **(10)**

Data Transfer Schemes: Interrupt structure-Programmed I/O, DMA-Serial I/O. Interfacing Devices: Types of interfacing devices-Input/Output ports 8212, 8255,8251,8279. Octal latches and tristate buffers-A/D and D/A converters-Switches, LED's ROM and RAM interfacing. Applications: Data acquisitions-Temperature control-Stepper motor control-Automotive applications engine control,

UNIT-5: **(10)**

Suspension system control, Driver information systems, Development of a high speed, high precision learning control system for the engine control.

Text Books:

1. Ramesh, Goankar.S., Microprocessor Archietecture Programming and Applications, Wiley Eastern Ltd.,New Delhi,1986.
2. Aditya .P. Mathur, Introduction to Microprocessors, III Edition Tata McGraw Hill Publishuing Co Ltd New Delhi,1989.

Reference Books:

1. Ahson. S. I., Microprocessors with Applications in Process Control,Tata McGraw Hill New Delhi,1986.SAE Transactions,1986 Sec 3.
2. Jabez Dhinagfar .S., Microprocessor Applications in Automobiles.
3. L. Bianco and A. Labella., Automotive Micro Electronics, Elsevier science Publishers,1986.

TRANSPORT MANAGEMENT AND AUTOMOBILE INDUSTRY

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Management Training and Operations: Basic principles of supervising. Organising time and people. Job instruction training, training devices and techniques. Driver and mechanic hiring. Driver checklist, Lists for driver and mechanic. Trip leasing. Vehicle operation and types of operation.

UNIT-2: **(10)**

Vehicle Maintenance: Scheduled and unscheduled maintenance Planning and scope. Evaluation of PMI program, Work scheduling, Overtime, Breakdown analysis, Control of repair backlogs, Cost of options. Vehicle Parts,

UNIT-3: **(10)**

Supply Management and Budget: Cost of inventory, Balancing inventory cost against downtime, Parts control, Bin tag systems. Time management, Time record keeping, Budget activity, Capital expenditures, Classification of vehicle expenses. Fleet management and data processing, Data processing systems- Software. Models – Computer controlling of fleet activity. Energy management.

UNIT-4: **(10)**

Scheduling and Fare Structure: Route planning, Scheduling of transport vehicles, Preparation of timetable, Costs, fare structure, methods of the fare collection, Preparation of fare table. Motor Vehicle Act: Schedules and sections, Registration of motor vehicles, Licensing of drivers, Control of permit, Limits of speed, traffic signs.

UNIT-5: **(10)**

Constructional regulations. Description of goods carrier, delivery van, tanker, tipper, Municipal, fire fighting and breakdown service vehicle. Automobile Industry: History and development of the automobile industry, market trends, current scenario in Indian auto industry, Auto ancillary industries, Role of the automobile industry in national growth.

Text Books:

1.Kitchin. L. D., Bus Operation, IIIiffe and Sons Ltd., London, III Edition, 1992

Reference Books:

1. John Dolu, Fleet Management, McGraw Hill Co., 1984
2. Government Publication, The Motor Vehicle Act, 1989
3. 4. Kadiyali. L.R., Traffic Engineering and Transport Planning.

AUT002: TOTAL QUALITY MANAGEMENT

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction (10)

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT-2: TQM Principles (10)

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT-3: Statistical Process Control (SPC) \ (10)

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

UNIT-4: TQM Tools (10)

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

UNIT-5: Quality Systems (10)

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

Text Books

1. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

Reference Books:

1. James R.Evans & William M.Lidsay, “The Management and Control of Quality”, (5th Edition), South-Western (Thomson Learning), 2002
2. Feigenbaum.A.V. “Total Quality Management”, McGraw-Hill, 1991.
3. Oakland.J.S. “Total Quality Management”, Butterworth Hcinemann Ltd., Oxford, 1989.
4. Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”, New Age Intl. 1996.
5. Zeiri. “Total Quality Management for Engineers”, Wood Head Publishers, 1991.

OFF-ROAD VEHICLES

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Classification and Requirements of Off Road Vehicles: Power plants, chassis and transmission, Multiaxle vehicles.

UNIT-2: **(10)**

Land clearing machines: Bush cutter, stumpers, Tree dozer, Rippers.

UNIT-3: **(10)**

Earth Moving Machines: Bulldozers, cable and hydraulic dozer. Crawler trach, running and steering gears, scrapers, drag and self powered types – Dump track and dumpers – Loaders, single bucket, multi bucket and rotary types- Power and capacity of earth moving machines.

UNIT-4: **(10)**

Scrapers and Graders: Scrapers, elevating graders, self powered scrapers and graders. Shovels and Ditchers : Power shovel, revolving and stripper shovels – drag lines – ditchers – Capacity of shovels.

UNIT-5: **(10)**

Miscellaneous off-road vehicle: All terrain vehicle, snowmobile, sandmobile, quad bike, tractors and special purpose vehicles

Text Books:

1. Abrosimov.K. Bran berg. A. and Katayer. K., Road making Machinery, MIR Publishers, Moscow, 1971.

Reference Books:

1. Wang. J.T., Theory of Grand vehicles, John Wiley & Sons, New York, 1987
2. Off the road Wheeled and combined traction devices – Ashgate Publishing Co. Ltd. 1988

FINITE ELEMENT METHODS AND ITS APPLICATION

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction : Review of various approximate methods in structural analysis. Stiffness and flexibility matrics for simple cases. Basic concepts of finite element method.

UNIT-2: **(10)**

Formulation of governing equations and convergence criteria. Discrete Elements: Use of bar and beam elements in structural analysis. Computer implementation of procedure for these elements.

UNIT-3: **(10)**

Continuum Elements: Different forms of 2D elements and their applications for plane strees, plane strain and axi-symmetric problems. Consistent and lumped formulation. Use of local coordinates. Numerical integration.

UNIT-4: **(10)**

ISO Parametric Elements: Definition and use of different forms of 2D and 3D elements. Computer implementation of formulation of these elements for the analysis of typical structural parts.

UNIT-5: **(10))**

Solution Schemes: Different methods of solution of simultaneous equations governing static, dynamic and stability problems. General purpose software packages.

Text Books:

1. Krishnamurthy. C.S., Finite Element Analysis, Tata McGraw Hill., 1987

Reference Books:

1. Segerlind. L.J., Applied Finite Element Analysis, Secon Edition, John Wiley and Sons Inc., New York, 1984.
2. Bathe.K.J. and Wilson. E.L., Numerical methods in finite element analysis, PHI, 1983.
3. Cook. R.D., Concepts and Applications of Finite Element analysis, 3rd Edition, John Wiley & Sons, 1989.
4. Ramamurthi.V., Computer Aided Design in Mechanical Engineering, Tata TMH, 1987.

MANAGEMENT INFORMATION SYSTEM

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Organisation & Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, Various channels of information & MIS.

UNIT-2: **(10)**

Foundation of Information System : Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS-dataflow diagram, flow chart etc.

UNIT-3: **(10)**

Business application of information technology, electronic commerce, Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage.

UNIT-4: **(10)**

Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change, Reports: Various types of MIS reports, GUI & Other Presentation tools.

UNIT-5: **(10)**

Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, Production & Logistics. Supply Chain Management, CRM, Procurement Management System Object Oriented modeling case studies.

Text Books:

1.Bansal, “Information System Analysis & Design”, TMH.
2.Jawadegar, “Management Information System”, TMH.

Reference Books:

1. O.Brian, “Introduction to Information System”, Mc-Graw Hill.
2. O.Brian, “Management Information System”, TMH.
3. Alter, “Information Systems : A Management Perspective”, Addison Wesley.
4. Arora & Bhatia, “Information Systems for Managers”, Excel
5. Murdick, “Information System for Modern Management”, PHI.
6. Alexis Leon, “Enterprise Resource Planning”, TMH.

ENTREPRENEURSHIP AND E-BUSINESS

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction: Concept of Entrepreneurship - need and scope for entrepreneurship - Entrepreneur and society - qualities of entrepreneur Risks, relevance and benefits of small scale Industry - definition of tiny, small ancillary industry - prevailing industrial policy of SSI - incentives and benefits of SSI units.

UNIT-2: **(10)**

Motivation theories - Maslow, McCllend - Motivation model - need, want, motive and behaviour - attitude towards work - self assessment and goal setting - Achievement, motivation and behaviour measurement, SWOT analysis, TA analysis - Stress and conflict management; coping with uncertainty; creativity and innovation.

UNIT-3: **(10)**

Project identification and formulation: Sources of information - opportunity guidance - choice of technology and its evaluation; Consumer behaviour; market survey and research; demand and resource based industry- servicing industry - import substitution- Techno economic feasibility assessment - short listing, preliminary project report, detailed project report, assessing viability and feasibility of a report.

UNIT-4: **(10)**

Forms of business organisations/ownership - formation of a Company - procedures and formalities for setting up of new industry, subsidies and concessions for SSI role of State and Central Government, Agencies in promotion of Small Scale Industry. Sickness and nursing of sickness in SSI.

Labour Laws - The Factories Act 1948, Minimum Wages Act - Payment of Wages 1936, Workmen Compensation Act, 1923. Taxation - State and Central - Concessions.

UNIT-5: **(10)**

Introduction to e-business; EDI and e-commerce; EDI standard, implementation and Tools; e-commerce imperatives, e-commerce applications: I - Markets, Customer care, Vendor Management and Extended supply chain management; security aspects -cryptography, digital signature, digital watermarking, secured socket layers, understanding threats to security, securing internet connections, Firewall techniques, electronic payment systems - ATM model, Payment Models, credit card based payment system, virtual banking, e-cash, smart cards; Electronic Data Interchange EDI)- Value added networks.

Textbooks and References:

1. Handbook for New Enterpreneurs, EDII, Ahmedabad.
2. Entrepreneurial Development by P.Saravanavel.

QUALITY CONTROL AND RELIABILITY

L T P: 4 0 0 **Credits: 4**

UNIT- 1: Quality Concepts **(10)**

Quality - Facor influencing quality costs- Economics of quality quality assurance – statistical Tools used in quality in SQC - Quality planning - Organisation for quality, Bureau of Indian Standards – ISO 9000 - quality circles KAIZEN - TQM concepts - Quality audit.

UNIT-2: Statistical Process Control **(10)**

Variation in processes - Factors - Process capability - Analysis of process capability - control charts - variables - Attributes - Establishing and interpreting control charts - X.R.charts for variables - defects - P charts. C-charts and U-charts-Control charts for Defective and quality rating.

UNIT-3: Acceptance Sampling **(10)**

Lot-by-lot samping - types probability of acceptance in single, double, multiple sampling techniques - O.C. curves - producer's Risk and consumer's Risk AQL, LTPD - uses of standard sampling plans.

UNIT-4: Life Testing - Reliability Systems Approach **(10)**

Life testing - objectives - classification - failure characteristics - failure data analysis - mean time to failure - maintainability and availability - reliability - system reliability - series and parallel systems - systems reliability in terms of probability of failure - MTBF - Acceptance sampling based on reliability test OC curves .

UNIT-5: Quality and Reliability **(10)**

Reliability improvement - techniques - use of parato analysis - Design for reliability - Redundancy – standby redundancy - failsafe systems - optimazation in reliability - product Design - product Analysis Product Development product life cycle.

Text Books:

1. Betster field D.H. " Quality Control ", Prentice Hall Pub (1993) (Revised Edn).
2. Sharma S.C. " Inspection Quality Control and Reliability", Khanna Publishers New Delhi

Reference Books:

1. John Bank, " The Essence of Total Quality Management ", Prentice Hall of India P Ltd.
2. Danny Samson, " Manufacturing & Operations strategy ", Prentice Halls New York 1991.
3. Ganapathy K.Subramaniam B. Narayana " V-Quality Circle concepts and implementation " QCFI. Secondrabad 919940.
4. Tapan P. " Bagchi ISO9000. concepts methods and implementation ", Wheeler Publisher Allahabad 1994.
5. Conner P.D.T.O. " Practical Reliability Engineering ", John Wiley 1993.
6. Green A.E. and Bourne A.J. " Reliability, Technology ", Wiley Interscience 1991.

MEC014: AUTOMOTIVE TRANSMISSION

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Vehicle Layouts: Introduction, Classification of automobile, Types of chassis layout with reference to power plant locations and type of drive, Types of chassis- fully forward, semi forward, Truck or bus chassis, two & three wheeler chassis layout

Clutches: Principle, functions, general requirements, torque capacity, types of clutches, cone clutch, single-plate clutch, diaphragm spring clutch, multi-plate clutch, centrifugal clutch, electromagnetic clutch, lining materials, over-running clutch, Clutch control systems.

UNIT-2: **(10)**

Gear Box: Necessity of gear box, Resistance to motion of vehicle, Requirements of gear box, Functions of gear box, Types, Sliding mesh, Constant mesh, Synchromesh. Principle, construction and working of synchronizing unit, Requirements & applications of helical gears, Gear selector mechanism, Two wheeler gear box, Lubrication of gear box, Overdrive gears, Performance characteristics.

UNIT-3 **(10)**

Drive Lines: Effect of driving thrust and torque reaction, propeller shaft-universal joints, hooks and constant velocity U.J., Drive line arrangements – Hotchkiss drive & torque tube drive, Rear wheel drive & front wheel drive layouts.

Final Drive & Rear Axle: Purpose of final drive & drive ratio, Different types of final drives, need of differential, Constructional details of differential unit, Non-slip differential, Differential lock, Differential housing, Function of rear axle, Construction, Types of loads acting on rear axle, Axle types - semi-floating, full floating, three quarter floating, Axle shafts, Final drive lubrication.

UNIT-4: **(10)**

Transmission with Fluid Flywheel & Torque converter: Operating principle, Construction and working of fluid flywheel, Characteristics, Advantages & limitations of fluid coupling, Torque converter, construction and working of torque converter, Performance characteristics, Comparison with conventional gear box.

Epicyclic Gear Boxes: Simple epicyclic gear train, Gear ratios, Simple & compound planet epicyclic gearing, Epicyclic gear boxes, Wilson Epicyclic gear train - Construction and operation, Advantages, Clutches and brakes in epicyclic gear train, compensation for wear, performance characteristics.

UNIT-5: **(10)**

Automatic Transmission: Principle of semi automatic & automatic transmission, Hydramatic transmission, Fully automatic transmission, Semi automatic transmission, Hydraulic control system, Continuous variable transmission (CVT) – operating principle, basic layout and operation, Advantages and disadvantages

Text Books:

1.Automatic Transmission, Chek Chart, A Harper & Raw Publication

Reference Books:

Motor Vehicles, Newton, Steed & Garrot, 13th Edition, Butterworths London,

1. Modern Transmission, Judge A. W.,Chapman & Hall Std., 1989
2. Steering, Suspension & Tyres, Giles J. G.,– Lliffe Book Ltd., London
3. Mechanics of Road Vehicles, Steed W., Lliffe Book Ltd.
4. Automotive Mechanics K Giri, Khanna Publishers, Delhi, Eighth Edition

AUTOMOTIVE SAFETY

L T P: 4 0 0 **Credits: 4**

UNIT-1: Introduction **(10)**

Design of the body for safety, energy equation, engine location, deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle, concept of crumble zone, safety sandwich construction.

UNIT-2: Safety Concepts **(10)**

Active safety: driving safety, conditional safety, perceptibility safety, operating safety- passive safety: exterior safety, interior safety, deformation behavior of vehicle body, speed and acceleration characteristics of passenger compartment on impact.

UNIT-3: Safety Equipments **(10)**

Seat belt, regulations, automatic seat belt lightener system, collapsible steering column, tilt able steering wheel, air bags, electronic system for activating air bags, bumper design for safety.

UNIT-4: Collision Warning and Avoidance **(10)**

Collision warning system, causes of rear end collision, frontal object detection, rear vehicle object detection system, object detection system with braking system interactions.

UNIT-5: Comfort and Convenience System **(10)**

Steering and mirror adjustment, central locking system, Garage door opening system, tire pressure control system, rain sensor system, environment information system

Text Books:

1. Bosch - “Automotive Handbook” - 5th edition - SAE publication - 2000.

Reference Books:

1. Powloski.J - “Vehicle Body Engineering” - Business books limited, London - 1969.
2. Ronald.K.Jurgen - “Automotive Electronics Handbook” - Second edition- McGraw-Hill Inc., - 1999.

COMPUTER AIDED VEHICLE DESIGN

L T P: 4 0 0 **Credits: 4**

UNIT -1: Performance Curves **(10)**

Resistance. Power and torque curves. Diving force against vehicle speed. Acceleration and gradability in different gears for a typical car or truck plotted from specifications available in Automoblie Journals.

UNIT-2: Expectancy Curves **(10)**

Calculation and plotting the curves of Air and Rolling resistances, Driving force. Horsepower. Rear axle ratio.

UNIT-3: **(10)**

Engine speed. Torque and mechanical efficiency for different vehicle speeds. Pressure volume diagram.

UNIT-4: **(10)**

Frictional mean effective pressure. Engine capacity. Bore and stroke length. Connecting rod length to crank radius ratio. Piston velocity and acceleration against crank angle. Gas force, interia force and resultant force against crank angle. Turning thrust on cylinder wall.

UNIT-5: **(10)**

Determination of gear ratios. Acceleration and gradability. Typical problems on vehicle performance.

Text Books:

1. Heldt.P.M. " High Speed Combustion Engine ", Oxford & IBH Publishing Co., Calcutta,

Reference Books:

1. Lichty. " IC Engines ", Kogakusha Co.Ltd., Tokyo, 1991.
2. "Automotive Engineering Journals Auto Car ", Automotive Industries, Automobile Engineer.
3. Giri.N.K., " Automoblie Mechanics ", Khanna Publishers, New Delhi, 1986.

TWO AND THREE WHEELERS

L T P: 4 0 0 **Credits: 4**

UNIT-1: The Power Unit **(10)**

Two stroke SI engine, merits and demerits. Symmetrical and unsymmetrical port timing diagrams. Types of scavenging processes, merits and demerits, scavenging efficiency. Scavenging pumps. Rotary value engine. Fuel system. Lubrication system. Magneto coil and battery coil spark ignition system. Electronic Ignition System Starting system. Kick starter system.

UNIT-2: Chassis and Sub-Systems **(10)**

Main frame, its types. Chassis and shaft drive. Single, multiple plates and centrifugal clutches. Gear box and gear controls. Fornt and rear suspension systems. Shock absorders. Panel meters and controls on handle bar.

UNIT-3: Brakes And Wheels **(10)**

Drum brakes, Disc brakes, Front and rear brake links lay-outs. Spoked wheel, cast wheel. Disc wheel. Disc types. Tyres and tubes.

UNIT-4: Two Wheelers **(10)**

Case study of major Indian models of motor cycles, scooters and mopeds. Bajaj, Vespa, Lambretta Scooters. Enfield, TVS-suzuki, Hero Honda, Yamaha RX-100, Kawasaki Bajaj Motor cycles. Kinetic Spark, Hero Majestic, TVS Mopeds. Servicing and maintenance.

UNIT-5: Three Wheelers **(10)**

Case study of Indian models. Front engine and Rear engine. Auto rickshaws. Pick up van. Delivery van and Trailer.

Text Books:

1. Irving.P.E., " Motor cycle Engineering ", Temple Press Book, London, 1992.

Reference Books:

1. " The Cycle Motor Manual ", Temple PressLtd., London, 1990.
2. " Encyclopedia of Motor cycling, 20 volumes ", Marshall Cavensih, New York and London, 1989.
3. Bryaut.R.V., " Vespa Maintenance and Repair series ".
4. Raymond Broad, Lambretta - " A practical guide to maintenance and repair ", 1987.

AUT003: AUTOMOTIVE VEHICLE MAINTENANCE

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

MAINTENANCE RECORDS AND SCHEDULE Importance of maintenance. Scheduled and unscheduled maintenance. Preparation of check lists. Chassis lubrication. Cost effectiveness. Pre-trip. Inspection forms. Log books. Trip sheets. Other maintenance record forms

UNIT-2: **(10)**

MAINTENANCE, REPAIR AND OVERHAULING OF ENGINE

Dismantling of engine components. Cleaning methods. Visual inspection and dimensional check of various engine components. Minor and Major tune up Reconditioning, repairing methods of engine components. Assembly procedure. Special tools used for maintenance, repair and overhauling.

UNIT-3: **(10)**

MAINTENANCE, REPAIR Clutch - Mechanical, Automatic types Gear box - Mechanical Automatic types. Final reduction. Propeller shaft. Front and rear suspension systems. Rigid and independent types. Brakes systems - Hydraulic, Servo, Air. Air bleading. Steering system. Wheel alighment - Tyres.

UNIT-4: **(10)**

MAINTENANCE, REPAIR AND SERVICING OF ELECTRICAL SYSTEMS

Battery - Testing methods. Starter motor. Charging system - DC Generator, AC Alternator, Regulator, Ignition systems - Coil ignition,Transistor assisted ignition, Capacitor discharge ignition. Eletric Horn, Wiper, Flasher, Electric fuel pump, Gauges. Lighting system Head lights focussing. Wiring system.

UNIT-5: **(10)**

COOLING SYSTEM AND LUBRICATION SYSTEM Cooling system - types, water pump, radiator, thermostat valve. anti corrosion and anti freezing solutions.

Lubricating system - Oil analysis, oil topping up, oil change, oil filters, oil relief valve. Fuel system - Petrol, diesel fuel feed system components. Body repair tools, minor body panel beating, tinkering, soldering, polishing, painting. Door locks mechanism. Window glass actuating mechanism.

Text Books:

1. Judge.A.N., " Motor vehicle engine servicing, 3rd, Edition ", Pitman Paperpack, London,

Reference Books:

1. JOHN Doke, " Fleet management ", McGraw Hill Co, 1984.
2. Judge.A.W., " Maintenance of High speed diesel engines ", Chapman Hall Ltd., London,
3. Maleev.V.L., "Diesel Engine operation and Maintenance", Maintenance, McGraw Hill Book Co., New York, 1954.
4. John.W.Vale.J.R., " Modern Auto Body and Finder repair ".
5. Venk.Spicer." Automotive Maintenance and Trouble shooting ".

6. " Vehicle Service Manuals of reputed manufactures ".

AUTOMOTIVE ELECTRICAL & ELECTRONICS

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Batteries

Principle and construction of lead-acid battery. Characteristics of battery rating Capacity and efficiency of batteries. Various tests on battery condition charging methods.

Starting System

Condition at Starting Behaviour of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Working of different starter drive units, care & maintenance of starter motor. Starter switches.

Charging System

Generation of direct current. shunt generator characteristics. Armature reaction. Third brush regulation. Cut-out. Voltage & current regulators. compensated voltage regulator - alternators principle & constructional aspects and bridge rectifiers.

Ignition System

Types, construction & working of battery coil and magneto ignition systems. Relative merits, centrifugal and vaccum advance mechanisms, Types and construction of spark plugs, Electronic Ignition system.

UNIT-2: **(10)**

Lighting System & Accessories

Insulated & earth return systems. Positive & negative earth systems. Details of head light & side light. Head light dazzling & preventive methods. Electrical fuel-pump, Speedometer, Fuel, oil & temperature gauges, Horn, Wiper system, Trafficator.

UNIT-3: **(10)**

Fundamental Of Automotive Electronics

Current trends in mordern Automoblies, Open loop and closed loop systems - Components for electronic engine management. Electronic management of chassis system - Vehicle motion control.

UNIT-4: **(10)**

Sensors and Actuators

Introduction, basic sensor arrangement, types of sensors such as - oxygen sensors, Crank angle position sensors - Fuel metering / vehicle speed sensor and detonation sensor - Altitude sensor, flow sensor. Throttle position sensors, solenoids, stepper motors, relays.

Electronic Fuel Injection and Ignition Systems

Introduction, Feed back carburettor systems (FBC) Throttle body injection and muli port or point fuel injection, Fuel injection systems, injection system controls. Advantages of electronic ignition systems. Types of solid state ignition systems and their principle of operation, Contactless electronic ignition system, Electronic spark timing control.

UNIT-5: **(10)**

Digital Engine Control System

Open loop and closed loop control systems - Engine cranking and warm up control - Accleration enrichment - Deceleration leaning and idle speed control. Distributorless ignition - Integrated engine control system, Exhaust emission control engineering.

Electromagnetic Interference Suppression

Electromangetic compatibility - Electronic dash board instruments - Onboard diagnosis system. security and warning system.

Text Books:

1. Judge. A.W., " Modern Electrical Equipment of Automoblies ", Chapman & Hall, London,
1. Crouse. W.H., " Automobile Electrical Equipment ", McGraw Hill Book Co. Inc., New York,

Reference Books:

1. Young. A.P., & Griffiths.L., " Automobile Electrical Equipment ", English Languages Book Society & New Press, 1990.
2. Vinal. G.W., " Storage Batteries ", John Wiley & Sons Inc., New York, 1985.
3. Crouse. W.H., " Automobile Electrical Equipment ", McGraw Hill Book Co. Inc., New York,
4. Spreadbury. F.G., " Electrical Ignition Equipment ", Constable & Co Ltd., London, 1962.
5. Kholi. P.L., " Automotive Electrical Equipment ", Tata McGraw-Hill Co. Ltd.
6. Automotive Hand Book, Robert Bosch, Bently Publishers, 1997.

AUT004: MECHANICAL VIBRATIONS

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Fundamentals: Importance of Study of Vibrations, Classifications of Vibrations, Free and Forced, Undamped and Damped, Linear and Non-linear, Deterministic and Random, Harmonic Motion, Vector and Complex Number Representations, Definitions and Terminology, Periodic Functions, Harmonic Analysis, Fourier Series Expansion.

UNIT-2: **(10)**

Free and Damped Vibrations: Single Degree of Freedom system, D'Alemberts Principal, Energy Methods, Rayleighs Method, Application of these Methods, Damped Free Vibrations, Logarithmic Decrement, Under Damping, Critical and Over Damping, Coulomb Damping.

UNIT-3: **(10)**

Harmonically Excited Vibrations: Forced Damped Harmonic Vibration of Single Degree of Freedom Systems, Rotating Unbalance, Rotor Unbalance, Critical Speeds and Whirling of Rotating Shafts, Support Motion, Vibration Isolation, Energy Dissipated by Damping, Equivalent, Viscous Camping, Structural Damping Sharpness of Resonance, Vibration Measuring Instruments.

UNIT-4: **(10)**

Transient Vibrations: Impulse Excitation, Arbitrary Excitation, Response to Step Excitions, Base Excitation Solution by Laplace Transforms, Response Spectrum, Runge-Kutta Method. Two Degrees of Freedom Systems : Introduction to Multi-Degree of Freedom Systems, Normal Mode Vibrations, Coordinate Coupling, Principal Coordinates, Free Vibrations in Terms of Initial Conditions, Forced Harmonic Vibrations, Vibration Absorber, Centrifugal Vibration Absorber, Vibration Damper.

UNIT-5: **(10)**

Multi degrees of Freedom Systems and Numerical Methods: Introduction, Influence Coefficients, Stiffness Matrix, Flexibility Matrix, Natural Frequencies and Normal Modes, Orthogonality of Normal Modes, Dunkerley's Equation, Method of Matrix Iteration, The Holzer Type Problem, Geared and Branched Systems, Beams.

Normal Mode Vibration of Continuous System: Vibrating String, Longitudinal Vibrations of Rod, Torsional Vibrations of Rod, Lateral Vibrations of Beam.

Text Books:

1. Theory of Vibrations with Applications W.T. Thomson, Prentice Hall of India.
2. Mechanical Vibration : G.K. Grover and S.P. Nigam, Nem Chand and Sons

Reference Books:

1. Theory and Practice of Mechanical Vibrations J.S. Rao and K. Gupta, Wiley Eastern Ltd.
2. Mechanical Vibrations S.S. Rao, Addison – Wesely Publishing Company

AUT005: AUTOMOTIVE POLLUTION AND CONTROL

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction

Pollutants - sources - formation - effects - transient operational effects on pollution.

UNIT-2: **(10)**

Si Engine Combustion And Pollutant Formation

Chemistry of SI engine combustion - HC and CO formation in 4-stoke and 2-stroke SI engines - NO formation in SI engines - Particulate emissions form SI engines - Effects of operating variables on emission formation.

UNIT-3: **(10)**

CI Engine Combustion And Emissions

Basics of diesel combustion - Smoke emission in diesel engines - NO emission from diesel engines – Particulate emission in diesel engines. Color and Aldehyde emissions from Diesel engines - Effects of operating variables on emission formation.

UNIT-4: **(10)**

Control Techniques for Si and Ci Engine Emission Reduction

Design changes - Optimization of operating factors - Exhaust gas recirculation - Fumigation - Air injection PCV system - Exhaust treatment in SI engines - Thermal reactors - Catalytic converters - Catalysts - Use of unleaded petrol.

UNIT-5: **(10)**

Test Procedure & Instrumentation for Emission Measurement and Emission Standards

Test procedures - NDIR analyser - Flame ionization detectors - Chemiluminescent analyser – Gas chromatograph - Smoke meters - Emission - standards.

Text Books:

1. Springer and Patterson, Engine Emission, Plenum Press, 1990.

Reference Books:

1. Ganesan.V., " Internal Combustion Engines ", Tata McGraw Hill Co., 1994.
2. SAE Transactions, " Vechicle emission ", 1982 (3 volums).
3. Obert.E.F., " Internal Combustion Engines ", 1982.
4. Taylor.C.F., " Internal Combustion Engines ", MIT Press, 1972.
5. Heywood.J.B., " Internal Combustion Engine Fundamentals ", McGraw Hill Book Co.,
6. Automoblies and Pollution SAE Transaction, 1995.

PRINCIPLES OF ENVIRONMENTAL SCIENCE AND ENGINEERING

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Components of Environment

Components - Water, air and land - Inter-relationship between components- subcomponents; Ecosystem - Structure and functional components of ecosystem - Development and evolution of ecosystem - Energy flow and material cycling in ecosystem - Natural and man made impacts on water, air and land; Environment and development - Concept of sustainable development.

UNIT-2: **(10)**

Science of Environment

Chemistry, Physics and biology of water, air and land; Stress on the Chemistry, Physics and Biology of water, air and land owing to the impacts; Environmental quality objective and goals - Policies on development projects and their impacts, with emphasis on the branch of engineering of the student.

UNIT-3: **(10)**

Current Environmental Issues

Current Environmental issues at Country level - management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste - Air pollution due to industries and vehicles; Global issues - Biodiversity, Climatic change, Ozone layer depletion.

Minimisation of Stress - Principles of Physics, chemistry and biology in engineering interventions such as waste treatment - Flow sheets of engineering interventions relevant to the Engineering discipline of the student – Waste minimisation techniques - Clean technology options - Standards of performance of the interventions.

UNIT-4: **(10)**

Tools for Environmental Management

Environmental impact assessment; Precautionary Principle and Polluter Pays Principle; Constitutional provisions, Legal and economic instruments in Environmental Management; Role of Non-government organisations - Community participation environmental management works; International conventions and protocols; Pollution Control Boards and Pollution Control Acts.

UNIT-5: **(10)**

Field Study

In-depth study of environmental issues at least one environmentally sensitive site relevant to the discipline of the student and preparation of a report thereupon.

Text Books:

1. G.M.Masters, Introduction to Environmental Engineering & Science, Prentice Hall,
2. J.G. Henry and G.W.Heike, Environmental Science & Engineering", PHI, New Jersy, 1996.

Reference Books:

1. S. K. Dhameja, Environmental Engineering and Management, S. K. Kataria and Sons, 1999.
2. State of India's Environment - A Citizen's Report, Centre for Science and Environment and Others, 1999
3. Shyam Divan and Armin Rosancranz, Environmental Law and Policy in India, Cases, Materials and Statutes, Oxford University

AUT006: VEHICLE DYNAMICS

L T P: 4 0 0 **Credits: 4**

UNIT-1: **(10)**

Introduction

Fundamental of vibration, Mechanical vibrating systems. Modelling and Simulation - Model of an automobile - Single, two, multi degrees of freedom systems - Free, forced and damped vibrations. Mangnification factor - Transmissibility - Vibration absorber.

UNIT-2: **(10)**

Multi Degree Of Freedom Systems

Closed coupled system - Eigen valve problems - Far coupled Systems - Orthogonality of mode shapes – Modal analysis - Forced vibration by matrix inversion. Approximate methods for fundamental frequency - Dunkerley's lower bound - Rayleigh's upper bound - Hozler method for close coupled systems and branched systems.

UNIT-3: **(10)**

Suspension And Tyres

Requirements. Sprung mass frequency. Wheel hop, wheel wobble, wheel shimmy. Choice of suspension springrate. Calculation of effective spring rate. Vehicle suspension in fore and apt directions. Ride characteristics of tyre - Effect of driving and braking torque - Gough's tyre characteristics.

UNIT-4: **(10)**

Vehicle Handling

Oversteer, under steer, steady state cornering. Effect of braking, driving torques on steering. Effect of camber, transient effects in cornering. Directional stability of vehicles.

UNIT-5: **(10)**

Stability Of Vehicles

Load distribution. Calculation of Tractive effort and reactions for different drives - Stabiliy of a vehicle on a slope, on a curve and a banked road.

Text Books:

1. Gillespie.T.D., " Fundamental of vehicle dynamic society of Automotive Engineers ", Inc USA, 1992.

Reference Books:

1. Heldt.P.M. " Automotive Chassis ", Chilton Co., New York, 1992.
2. Ellis.J.R., " Vehicle Dynamics ", Business Books Ltd., London, 1991.
3. Giles.J.G. Steering, " Suspension and Tyres ", llliffe Books Ltd, London, 1998.
4. Giri.N.K., " Automobile Mechanics ", Khanna Publishers. New Delhi, 1986.
5. Rao.J.S. & Gupta.K., " Theory and Practice of Mechanical Vibrations ", Wiley Eastern Ltd., New Delhi, 1999

AUT007: AUTOMOTIVE CHASSIS DESIGN

L T P: 4 0 0 **Credits: 4**

UNIT – 1: **(10)**

Clutch Design Calculation

Design of single plate clutch, multi plate clutch, design of centrifugal clutch, cone clutch, energy dissipated, torque capacity of clutch, design of clutch components, design details of roller and sprag type of clutches

UNIT – 2: **(10)**

Gear Box

Performance of vehicle, total resistance to motion, traction and tractive effort, acceleration, calculation of gear ratio, design of three speed gear box, design of four speed gear boxes.

UNIT – 3: **(10)**

Vehicle Frame and Suspension

Study of loads, moments and stresses on frame members, computer aided design of frame for passenger and commercial vehicles, computer aided design of leaf springs, coil springs and torsion bar springs.

UNIT –4: **(10)**

Front Axle and Steering Systems

Analysis of loads, moments and stresses at different sections of front axle, determination of loads at kingpin bearings, wheel spindle bearings, choice of bearings, determination of optimum dimensions and proportions for steering linkages ensuring minimum error in steering.

UNIT – 5: **(10)**

Final Drive And Rear Axle

Design of propeller shaft, design details of final drive gearing, design details of full floating, semi-floating and three quarter floating rear shafts and rear axle housings.

Text Books:

1. Giri.N.K- “Automobile Mechanics”- Khanna Publisher, New Delhi- 2002

Reference Books:

1. Heldt.P.M - “Automotive Chassis”- Chilton Co., New York- 1992
2. Steeds. W -“Mechanics of Road Vehicles”- Illiffe Books Ltd., London- 1990
3. Giles.K.G - Steering, Suspension and tyres”- Illiffe Books Ltd., London - 1988
4. Newton Steeds & Garret- “Motor Vehicle”- Illiffe Books Ltd., London – 2000
5. Heldt.P.M- “Torque converter” - Chilton Book Co., New York - 1982
6. Dean Averns - “Automobile Chassis Design”- Illiffe Books Ltd – 1992

Annexure-XXII-C of Agenda Item no. 6.21

B.Tech.

in

Biotechnology

COURSE STRUCTURE & SYLLABI

(Academic sessions 2009-13, 2010-14 & 2011-15)

Department of Biotechnology
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Biotechnology	
School:	School of Engineering and Technology	
Name of the Course:	B.Tech. in Biotechnology	
Duration:	Four Years	
Total number of Credits:	208	
Date of Meeting of BOS:	April 27, 2012	
Members of BOS:	1. Dr. Simendra Singh, HOD	Chairman
	2. Prof. C. S. Dey, IIT-Delhi	Ext. Member
	3. Dr. V. K. Tiwari	Industry Invitee
	4. Prof. Rita Singh	Int. Member
	5. Dr. Shahana Majumder	Int. Member
	6. Dr. Pankaj Kishor Mishra, Asstt. Professor	Int. Member
	7. Mrs. Rashmi Pandita, Asstt. Professor	Int. member
	8. Mrs. Monika Jain, Asstt. Professor	Int. Member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

COURSE STRUCTURE

B.Tech. in Biotechnology

Semester	COURSES						Course	L	T	P	Weekly Contact	Credits
III	Foundation of Computes (4-1-0) 4	Business Correspondance (4-1-0) 4	Essentials of Marketing (4-1-0) 4	Introduction to Biomolecules (4-1-2) 5	Biostatistics (4-1-2) 5	Molecular Biotechnology (4-1-2) 5	6	24	6	6	36	27
IV	Applied Science (4-1-0) 4	Business Law (4-1-0) 4	Technical Presentation Skills (4-1-0) 4	Intermediary Metabolic Pathway (4-1-2) 5	Genetic Engineering (4-1-2) 5	Animal Biotechnology (4-1-2) 5	6	24	6	6	36	27

Semester	COURSES						Course	L	T	P	Weekly Contact	Credits
V	Writing for Technical Purposes (4-1-0) 4	Introductory Immunology (4-1-2) 5	Plant Biotechnology (4-1-2) 5	Basic Computational Biology (4-1-2) 5	Departmental Elective-I (4-1-0) 4	Departmental Elective –II (4-1-0) 4	6	24	6	6	36	27
VI	Industrial Economics (4-1-0) 4	Signal Transduction (4-1-2) 5	Advanced Environmental Biotechnology (4-1-2) 5	Departmental Elective-III (4-1-0) 4	Departmental Elective - IV (4-1-2) 5	Open Elective-I (4-1-0) 4	6	24	6	6	36	27
	Summer Training						-	-	-	-	-	02

Semester	COURSES							Course	L	T	P	Weekly Contact	Credits
VII	Communication Skills (4-1-0) 4	Bioethics and Biosafety (4-1-2) 5	Intellectual Property Rights (4-1-2) 5	Departmental Elective-V (4-1-0) 4	Departmental Elective-VI (4-1-0) 4	Open Elective-II (4-1-0) 4	Seminar 4	6	24	6	4	34	30
VIII	Sales & Distribution (4-1-0) 4	Departmental Elective-VII (4-1-0) 4	Departmental Elective-VIII (4-1-0) 4	Open Elective-III (4-1-0) 4	Project 8			4	16	4	-	24	24
											CREDIT - 208		

LIST OF DEPARTMENTAL ELECTIVES

1. Biophysics in Biological Science
2. Analysis of Genes and Genomes
3. Virology
4. Dairy Technology
5. Biopharmaceuticals
6. Proteomics
7. Food Microbiology
8. Molecular Plant Pathology
9. Pharmacognosy
10. Current Advances in Toxicology
11. Waste Management

LIST OF OPEN ELECTIVES

Nil

B.Tech.

in

Biotechnology

SYLLABI

BTY 207: Introduction to Biomolecules

L T P: 3-1-2 **Credit: 5**

Unit I: Carbohydrates **(10)**
Structure, classification and properties of monosaccharides, disaccharides, oligosachharides and polysaccharides; Lipids: structure, nomenclature and properties of fatty acids, triacylglycerols, phosphoglycerides, sphingolipids, steroids.

Unit II: Amino Acids and Peptides **(10)**
Structure, classification and properties (Physical and chemical).
Proteins: structure, disulphide cross links, alpha helix, beta sheet, 3D structure; Ramachandran plot.

Unit III: Nucleic Acids **(10)**
Base compositions, nucleosides, nucleotides structure of DNA, RNA; Biological properties and roles of DNA, RNA.

Unit IV: Vitamins Structure and Functions **(10)**
Classification properties and metabolic significance of vitamins (A, B complex, C, D, E and K).

Reference Books:

1. Nelson D.L. and Cox M.M., “Lehninger Principles of Biochemistry”, W H Freeman, 2004.
2. Wilson K. and Walker J., “Principles and Techniques of Biochemistry and Molecular Biology”, Cambridge University Press, 2000.

BTY 203: Biostatistics

L T P: 3-1-2 **Credit: 5**

Unit I: Introduction to Biostatistics **(10)**
Sampling techniques; Presentation of data, tabulation, and frequency distribution; Graphical representation of data by histogram, frequency polygon, frequency curve and cumulative frequency curve.

Unit II: Measures of Central Tendency and Probability **(10)**
Arithmetic, Geometric and Harmonic means; Median; Mode; Probability: discrete and continuous probability distribution; Correlation: Co-efficient of correlation, Rank correlation Regression

Unit III: Measures of Dispersion **(10)**
Mean deviation, standard deviation and standard error; Variance concept, calculation and theories of probability.

Unit IV: Test of Significance **(10)**
Sampling, sampling distribution testing of hypothesis, t-test, z'-test, chi-square test and F-test.

Reference Books:

1. Rosner B.A., "Fundamentals of Biostatistics", Cengage Learning, 2006.
2. Glantz S.A., "Primer of Biostatistics", McGraw-Hill, 2005.
3. Elston R.C. and Johnson W.D., "Basic Biostatistics for Geneticists and Epidemiologists: A Practical Approach", John Wiley and Sons, 2008.

BTY 201: Molecular Biotechnology

L T P: 3-1-2 **Credit: 5**

Unit I: DNA replication **(8)**
Prokaryotic and eukaryotic DNA replication; Mechanism of DNA replication; Enzymes, factors and other accessory proteins involved in DNA replication.

Unit II: Transcription **(10)**
Prokaryotic and eukaryotic transcription: basis of initiation, elongation and termination; Different RNA polymerases involved in transcription; General and specific transcription factors; Regulatory elements; Post-transcriptional modifications: polyadenylation, capping and RNA splicing.

Unit III: Translation **(12)**
Prokaryotic and eukaryotic translation, mechanisms of initiation, elongation and termination; Regulation of translation; Post-translational modifications of proteins.
Protein localization
Synthesis of secretory and membrane proteins; Intracellular transportation of different proteins; Expression and regulation of genetic information: Operon Concept, the lac operon and tryptophan operon.

Unit IV: DNA Repair and Recombination **(10)**
Homologous recombinations; Holiday junction; DNA repair mechanisms.
Oncogenes and Tumor suppressor Genes
Viral and cellular oncogenes; Tumor suppressor genes; Structure, function and mechanism of tumor suppressor proteins; Role of p53 and other proteins in cancer, carcinogens and other transforming agents.

Reference Books:

1. Sambrook J., Fritsch E.F. and Maniatis I., “Molecular Cloning: a Laboratory Manual”, Cold Spring Harbour Laboratory Press, 2000.
2. Watson J.D., Baker T.A., Bell S.P. and Gann A., “Molecular Biology of the Gene”, Benjamin Cummings, 2007.
3. Brown T.A., ‘Genomes”, Garland Science, 2006.

BTY 208: Intermediary Metabolic Pathways

L T P: 3-1-2 **Credit: 5**

Unit I: Carbohydrate Metabolism **(10)**
Glycolysis and its regulation; Glycogenolysis; TCA cycle, its function in energy generation; Alcoholic and lactic acid fermentations; Reactions and physiological significance of pentose phosphate pathway; Glyoxylate cycle and its role in conversion of fats into carbohydrates.

Unit II: Lipid Metabolism **(10)**
Oxidation of lipids; Biosynthesis of fatty acids; Ketogenesis; Synthesis of bile salts, bile acids, triacyl glycerol, phospholipids and sterols.

Unit III: Nitrogen Metabolism **(10)**
Transamination, oxidative deamination and decarboxylation; Urea cycle; Degradation and biosynthesis of amino acids and their regulation; Structure of proteins; Ramachandran plot; DNA protein and protein-protein interactions; Biosynthesis of purine and pyrimidines.

Unit IV: Bioenergetics **(10)**
Principles of energy; Energy transducins; Membranes energy interconversions; High energy compounds; Standard free energy of hydrolysis of ATP; Transfer potential of phosphate groups; Mitochondria ultrastructure, mitochondrial electron transport chain, inhibitors of electron transport; Proton exchange during electron transport, energetics of electron transport, coupling of electron transport to oxidative phosphorylation.

Reference Books:

1. Nelson D.L. and Cox M.M., “Lehninger Principles of Biochemistry”, W H Freeman, 2004.
2. Wilson K. and Walker J., “Principles and Techniques of Biochemistry and Molecular Biology”, Cambridge University Press, 2000.
3. Belk C. and Borden V., “Biology: Science for Life”, Benjamin Cummings, 2009.

BTY 204: Genetic Engineering

L T P: 3-1-2 **Credit: 5**

Unit I: Introduction to Genetic Engineering (8)
Scope, early discoveries and milestones; Introduction to gene cloning; Laboratory requirements for genetic engineering; Safety measures and regulations for recombinant DNA work; Basic steps of genetic engineering.

Unit II: Types of Enzymes in Genetic Engineering (12)
Types and functions of enzymes used in genetic engineering: restriction endonucleases, DNA ligases, DNA polymerases, Reverse transcriptases, Polynucleotide kinases, modification enzymes; Sticky and blunt ends; End labelling and other processes used in rDNA technology. Nucleic acid amplification and its applications: Isolation and purification of genomic DNA of plants, bacteria; Polymerase Chain Reaction, DNA polymerases used for PCR, applications of the PCR; Nucleic acid sequencing; Gene cloning vectors.

Unit III: cDNA Synthesis and Cloning (10)
mRNA enrichment; Reverse transcription; DNA primers, linkers and adaptors and their chemical synthesis; Library construction and screening, different methods of screening; Transformation of cDNA by electroporation, gene gun and microinjection.

Unit IV: Techniques in Biotechnology (10)
Different types of blotting techniques: Southern, northern and western; Antisense RNA, ribozyme technology and applications; Gene therapy: gene delivery, gene replacement augmentation, gene correction, gene editing, gene disruption, gene regulation and gene silencing.

Reference Books:

1. Sambrook J., Fritsch E.F and Maniatis T., “Molecular Cloning: a Laboratory Manual”, Cold Spring Harbor Laboratory Press, 2000.
2. Nicholl D.S.T., “An Introduction to Genetic Engineering”, Cambridge University Press, 2008.
3. Berger S.L. and Kimmel A.R., “Methods in Enzymology: Guide to Molecular Cloning Techniques”, Academic Press, 1998.

BTY 205: Animal Biotechnology

L T P: 3-1-2 **Credit: 5**

Unit I: Introduction to Animal Cell Culture (10)
Structure and organization of animal cell; Sources of cells; Techniques of obtaining cells by disaggregation of tissues; Enzymatic disaggregation; EDTA treatment; Types of cell culture; Equipments required for animal cell culture

Unit II: Media Preparation and Development of Cell Lines (10)
Medium (various types): natural, artificial, serum and protein free media; Advantages and disadvantages; Sub-culturing techniques; Viable cell counts with hemocytometer; Development of cell lines, types of cell lines, their characteristics; Suspension culture: advantages and disadvantages.

Unit III: Animal Cell Cloning and Stem Cell Technology (10)
Cloning, types of cloning, methods of cloning; Transfection and methods, retro-virus mediated gene transfer, embryonic stem cell-mediated gene transfer; Artificial twinning; Risks of cloning, cloned animals, totipotency in animal cell culture; Stem cell culture and technology, application of stem cells, haematopoiesis; Methods to study repopulation assay; *In vitro* cloning assay, long term marrow culture, embryonic stem cell culture.

Unit IV: Application of Animal Cell Culture Technology and Ethics (10)
Transgenic cells and animals and their application; Organ culture, Histotypic and organotypic culture; Rearing animal models and advantages; Potential of transgenic animals to improve human welfare in agriculture, medicine and industry; Ethical and value issues in animal biotechnology.

Reference Books:

1. Jenkins N., “Animal Cell Biotechnology: Methods and Protocols”, Humana Press, 1999.
2. Butler M., “Animal Cell Culture and Technology”, Garland Science, 2004.
3. Shenoy M., “Animal Biotechnology”, Laxmi Pub, 2007.

BTY 302: Introductory Immunology

L T P: 3-1-2 **Credit: 5**

Unit I: Brief History of Immunology (10)
Immune responses; Innate and acquired immunity; Organization and structure of lymphoid organs; Nature, biology and types of antigens and super antigens; Antibodies-structure, types; Theories of antibody production; Hybridoma technology and monoclonal antibodies; Antigen-antibody interaction-agglutination, precipitation; Complement fixation; Immunofluorescence, ELISA, radioimmunoassay.

Unit II: Cells of the Immune System (10)
Major histocompatibility complex; Haematopoiesis and differentiation; Lymphocyte trafficking, B-lymphocytes, T-lymphocytes, macrophages, dendritic cells, langerhan cells, Natural killer cells and lymphokine activated killer cells, eiosinophils, neutrophils and mast cells.

Unit III: Cell-mediated Immune Response (10)
Antigen processing and presentation; Generation of humoral and cell-mediated immune responses; activation of B and T-lymphocytes, cytokines, and their role in immune regulation.

Unit IV: Cell-mediated Cytotoxicity (10)
Mechanism of T-cell and NK-cell mediated lysis; ADCC; Macrophage-mediated cytotoxicity; Hypersensitivity; Autoimmunity; Transplantation;, Immunity to infectious agents (inter-cellular parasites, helminthes and viruses).

Reference Books:

1. Kindt T.J., Osborne B.A and Goldsby R.A., “Kuby Immunology”, W. H. Freeman, 2006.
2. Delves P.J., Martin S.J., Burton D.R. and Roitt I.M., “Roitt’s Essential Immunology”, Wiley, 2011.

BTY 301: Plant Biotechnology

L T P: 3-1-2 **Credit: 5**

Unit I: Introduction to Plant Biotechnology **(10)**
Cell and tissue culture; Composition of tissue culture media; Initiation and maintenance of callus and cell suspension culture; Organogenesis; Single cell suspension culture and their application in selection of variants/mutants.

Unit II: Protoplast Culture **(10)**
Protoplast isolation culture and fusion; Production of haploids; Somaclonal variations; Germplasm conservation; Cryopreservation; Micropropagation techniques.

Unit III: Plant Secondary Metabolites **(10)**
Secondary metabolites of medicinal values; Strategies used for optimum production; Selection of high yielding variety; Elicitors; Permeabilization of cells; Removal of secreted products.

Unit IV: Plant Transformation Technology **(10)**
Agrobacterium-mediated gene transfer; Concept of vectors; Concept of plasmid, T-DNA; Gene transfer technology, chemical method, electroporation, microinjection, particle bombardment.

Reference Books:

1. Chawla H.S., “Introduction to Plant Biotechnology”, Science Publisher, 2002.
2. Bhojwani S.S. and Razdan M.K., “Plant Tissue Culture: Theory and Practices”, Elsevier, 1996.
3. Oksman-Caldentey K-M. and Barz W.H., “Plant Biotechnology and Transgenic Plants”, CRC Press, 2002.

BTY 303: Basic Computational Biology

L T P: 3-1-2 **Credit: 5**

Unit I: Bioinformatics Objectives and Overviews (8)
Bioinformatics objectives and overviews; Interdisciplinary nature of Bioinformatics; Data integration; Data analysis; Major Bioinformatics databases and tools.

Unit II: DNA, Proteins and Nucleic Acid (10)
Information molecules and information flow; DNA sequencing; Proteins: amino acids, protein structure, secondary, tertiary and quaternary structure; Protein folding and function; Nucleic acid-protein interaction.

Unit III: Operating System (10)
Linux Operating System; Perl basics, Bioperl and JAVA clients; Understanding and using biological databases, Java clients, CORBA; Introduction to biostatistics.

Unit IV: Genome and Genomic Sequencing (12)
Nucleotide sequence data; Genomic sequencing; Expressed sequence tags, gene expression, transcription factor binding sites and single nucleotide polymorphism; Computational representations of molecular biological data storage techniques: databases (flat, relational and object oriented, and controlled vocabularies; General data retrieval techniques: indices, Booleansearch, fuzzy search and neighboring; Application to biological data warehouses.

Reference Books:

1. O'Reilly, "Developing Bioinformatics Computer Skills", Indian Edition's Publication, 2001.
2. Rastogi R.C., Mendiratta N. and Rastogi P., "Bioinformatics Concepts, Skills and Applications", CBS Publishers, 2003.
3. Rashidi H.H. and Buehler L.K., "Bioinformatics Basics: Applications in Biological Science and Medicine", CRC Press, 2005.

BTY 001: Biophysics in Biological Science

L T P: 3-1-0 **Credit: 4**

Unit I: Biomechanics (10)
Introduction; Striated muscles: skeletal and cardiac muscles; Action potential curve; Contractile proteins; Mechanical properties of muscles; Contractile proteins and contraction mechanism; Role of Ca ions; Biomechanics of cardiovascular system; Brief overview of electrical activity during heart beat.

Unit II: Radiation Physics and Imaging Modalities (10)
Electromagnetic spectrum; Ionizing and non-ionizing radiations; X-rays, properties of α, β and γ-rays examined as examples of penetrating, ionizing forms of energy; Radiation units; Computerized tomography (CT); Magnetic Resonance Imaging (MRI); Gamma Camera; Radionuclide imaging.

Unit III: Radioisotope Methods and Tracer Techniques in Biology (10)
Basic principles of radioactivity; Nature of radioactivity, measurement of radioactivity, GM and scintillation counters, instruments for monitoring radioactivity; Use of radioisotopes in research; Radioactive cow; Properties and handling of radioisotopes in biology and medicine; Autoradiography; Radioimmunoassay.

Unit IV: Basic Biophysical Techniques (10)
Basic concept and description of spectroscopy; UV/Visible, InfraRed , Nuclear Magnetic Resonance (NMR) spectra; ESR; Mass spectroscopy; Lasers in biology and medicine.

Reference Books:

1. Pavia D.L., Lampman G.M., Kriz G.S. and James A., "Introduction to Spectroscopy", Vyvyan Publisher: Brooks Cole, 2008.
2. Farr R.F. and Allisy-Roberts P.J., "Physics for Medical Imaging', Elsivier 1997.
3. Rassier DE., "Muscle Biophysics: From Molecules to Cells", Springer, 2010.

BTY 002: Analysis of Gene and Genome

L T P: 3-1-0 **Credit: 4**

Unit I: Organization of Genome (10)
Genome maps and types; Current sequencing technologies; Partial sequencing; Gene identification; Gene prediction rules and software's; Genome databases; Annotation of genome. Genome diversity: taxonomy and significance of genomes: bacteria, yeast, *Caenorhabditis*, *Homo sapiens*, *Arabidopsis*, etc.

Unit II: Alternative Strategies of Cloning (10)
Cloning interacting genes; Yeast hybrid systems: Two and three hybrid systems; Cloning differentially expressed genes; *In vitro* translation and *in vitro* transcription; DNA microarray technology and its applications.

Unit III: Molecular Markers (10)
Introduction to molecular markers; DNA markers: restriction enzyme based markers; RFLP; SNPs; Microsatellite and minisatellite markers, PCR based markers, RAPD and AFLP; Use of molecular markers in genome analysis and genome mapping.

Unit IV: Site-directed Mutagenesis and Protein Engineering (10)
Changing genes; Primer extension: a method for site directed mutation; PCR based site directed mutagenesis, random mutagenesis; Use of phage display techniques to facilitate the selection of mutant peptides; Gene shuffling; Production of chimeric proteins.

Reference Books:

1. Primrose S.B. and Twyman R.M., "Principles of Genome Analysis and Genomics", Blackwell Publishing Company, 2003.
2. Carey M. and Smale S.T., "Transcriptional Regulation in Eukaryotes: Concepts, Strategies and Techniques", Cold Spring Harbor Laboratory Press, 2001.
3. Latchman D.S., "Gene Regulation: A Eukaryotic Perspective", Springer, 2008.

BTY 304: Signal Transduction

L T P: 3-1-2 **Credit: 5**

Unit I: G Protein-cCoupled Signalling Pathways (10)
Classification, structure and regulation of transmembrane receptors; G-protein-coupled receptors; Structure, ligand binding and signal transmission; Regulatory GTP-ases; Heterotrimeric G proteins; Second messengers: cAMP and cGMP.

Unit II: Protein Kinases (10)
Classification and characteristics of protein kinases; Protein phosphorylation and dephosphorylation; Regulation of Protein Kinase A pathway, Phosphatidyl-3-kinase (PI3K)/Akt pathway; Janus Kinase and Signal Transducer and Activator of Transcription (JAK-STAT) pathway; Protein cascades of MAPK; Organization of MAPK pathways.

Unit III: Phosphatase and their Types (10)
Role of phosphatase in signal transduction; Types of phosphatase: Tyrosine, serine/threonine, dual specificity phosphatase and their physiological relevance.

Unit IV: Apoptosis (10)
Classification and functions of caspases; Intrinsic and Extrinsic death pathways; Bcl-2 protein family; Role of p53 in apoptosis.

Reference Books:

1. Krauss G., "Biochemistry of Signal Transduction and Regulation', Wiley-VCH, 2008.
2. Hancock J.T., "Cell Signalling", Oxford University Press, 2010.
3. Gomperts B.D., Kramer I.M. and Tatham P.E.R., "Signal Transduction", Academic Press, 2009.

BTY 305: Advanced Environmental Biotechnology

L T P: 3-1-2 **Credit: 5**

Unit I: Environment Degradation (10)
Introduction to Environmental Biotechnology; Factors responsible for environmental degradation; Environmental pollution, pollutants and their types, nature and source; Pollution monitoring and measurement; Biosensors for environment testing; Environmental impact assessment.

Unit II: Biotechnology in Waste Management and Treatment (10)
Sewage and wastewater treatment, primary and secondary treatment (aerobic and anaerobic waste treatments); Bioreactors for waste water treatment: periodic biological reactors (Sequencial Batch Reactors), membrane bioreactors; Tertiary treatments; Solid waste management by landfills, composting, vermiculture, bioaugmentation, bioremediation.

Unit III: Biodegradation of Xenobiotic Compounds (10)
Biodegradation; Organisms involved in degradation of chlorinated hydrocarbons, polyaromatic hydrocarbons, pesticides; Microbial treatment of oil pollution; Microbial leaching: extraction of metals from their ores; Biomining, microbial systems for heavy metal accumulation/removal.

Unit IV: Biofuels and Restoration of Degraded Land (10)
Biofuels from plant and agriculture residues; Biodiesel, biogas, bioethanol, biohydrogen; Organic farming and use of microbes for improving soil fertility; Reforestation of lands contaminated with heavy metals; Release of genetically engineered organisms in environment; Environment laws and policies and regulatory aspects.

Reference Books:

1. Evans G.G and Furlong J. “Environmental Biotechnology: Theory and Application”, Wiley, 2011.
2. Fulekar M.H, “Environmental Biotechnology”, Science Pub, 2010.
3. Miller G.T. and Spoolman S., “Environmental Science”, Brooks Cole, 2010.

BTY 003: Virology

L T P: 3-1-0 **Credit: 4**

Unit I: General Virology **(10)**

Brief outline on discovery of viruses, nomenclature and classification of viruses: distinctive properties of viruses; morphology and ultra structure; Capsids and their arrangements; Types of envelops and their composition; Viral genome, their types and structures; Virus related agents (viroids, prions).

Unit II: Animal Viruses **(12)**

Classification and nomenclature of animal human viruses; Epidemiology, lifecycle, pathogenicity, diagnosis, prevention and treatment of Picorna, Ortho myxo, paramyxo, Toga, Rota HIV and other oncogenic viruses, Pox, Herpes, Adeno SV40, Hepatitis viruses; Viral vaccines, interferon and antiviral drugs.

Unit III: Bacterial viruses

Bacteriophage structural organization; Life cycle; One step growth curve; Burst size; Lysogenic cycle; Bacteriophage typing; Application in bacterial genetics.

Plant viruses **(8)**

Classifications and nomenclature; Effects of viruses on plant; Appearance of plants; Histology, physiology and cytology of plants; Transmission of plant viruses with vectors (insects, nematodes, fungi) and without vectors (contact, seed and pollens).

Unit IV: General methods of Diagnosis and serology **(10)**

Cultivation of viruses in embryonated eggs, experimental animals, cell cultures; Serological methods; heamagglutination and HAI; Compliment fixation; Immune fluorescence methods, ELISA and Radio immunoassays; assay of viruses physical and chemical methods; Infectivity assay (plague method, end point method); Infectivity of plant viruses.

Reference Books:

1. Fraser C.M., Read T. and Nelson K.E., “Bacterial Genomes (Infectious Disease)”, Humana Press, 2004.
2. Carter J. and Saunders V., “Virology: Principles and Applications”, Wiley, 2007.
3. Collier L., Oxford J. and Kellam P., “Human Virology”, Oxford University Press, 2011.

BTY 004: Dairy Technology

L T P: 3-1-0 **Credit: 4**

Unit I: Milk **(12)**

Definition, composition, chemical and functional properties of milk components; Physico-chemical properties of milk protein; Aggregation of milk casein, micelles; Factors affecting milk composition; Milk secretion and lactation

Unit II: Microorganisms **(12)**

Importance of dairy science and technology; Microbial spoilage of milk; Hydrolytic rancidity in milk and milk products; Auto-oxidation of milk fats and effects on milk quality.

Unit III: Milk Processing Operations **(8)**

Milk pasteurization; Homogenization and sterilization; Effect of processing of milk components and their functional properties.

Unit IV: Skimming of Milk **(12)**

Cream and cream characteristics; Manufacture of yogurt and other fermented milk products; Ice cream manufacture; Butter making technology; Technology of cheese preparation; Processing of concentrated milks and dried milk powder.

Milk quality control

Sanitation in the dairy plant; Adulteration of milk; Dairy equipment maintenance and waste disposal.

Reference Books:

1. Walstra P., Wouters J.T.M. and Geurts T.J., “Dairy Science and Technology”, CRC Press, 2005.
2. Hill H. and Harvey W.C., “Milk Products”, Biotech Books, 2008.
3. Chandan R.C. and Kilara A.M, “Dairy Ingredients for Food Processing”, Wiley-Blackwell, 2011.

BTY 401: Bioethics and Biosafety

L T P: 3-1-2 **Credit: 5**

Unit I: Biosafety (10)

Biosafety Regulations; Laws and Policies; Biosafety and agriculture, Genetic engineering and Health; Genetic engineering and food safety; International Centre for Genetic Engineering and Biotechnology; Third World Network Information Service on Biosafety; National and International guidelines for biosafety; Guidelines for laboratories; Guidelines for containments of green house; Guidelines for small scale field trials; r-DNA guidelines; Levels of containments.

Unit II: Environmental Aspects of Biotechnology and its applications (10)

Use of genetically modified organisms and their release in environment; Special procedures for r-DNA based product production; Biosafety Committees that form the Regulatory authorities: National Biosafety Committees (NBC); Their roles, responsibilities and activities; Institutional Biosafety Committee (IBC), Their roles, responsibilities and activities.

Unit III: Biosafety Guidelines (10)

Risk assessment; Determination of the level of safety concern (LSC), NIH guidelines, DBT guidelines, Code of conduct, Permit application system (PAS), Environmental assessment and Finding of no significant Impact; Biodiversity and farmer's right; Identification of directions for yield effect in agriculture, aquaculture, etc; Bioremediation.

Unit IV: Bioethical Issues (10)

Ethical, social, legal, philosophical and other issues arising in biological and medical research, health care and other areas of biotechnology; safety of GMOs, cloning, stem cell research, drug trials, availability, distribution and use of pharmaceuticals, xenotransplantation, and the safety of nanoparticles.

Reference Books:

1. "Biotechnologies and Development", UNESCO Publications, 2002.
2. "Biotechnologies in developing countries present and future", UNESCO publishers, 2004.
3. Sateesh M.K., "Bioethics and Biosafety", IK International Publishing, 2008.

BTY 402: Intellectual Property Rights

L T P: 3-1-2 **Credit: 5**

Unit I: Introduction to Intellectual Property Rights (10)
The concept of intellectual property; WIPO: history, mission and activities, structure, administration; Indian laws and treaties for IPR.

Unit II: Fields of Intellectual Property Protections (10)
Patents (Conditions of Patentability, Infringement, Exploitation of the Patented Invention, Compulsory Licenses).
Copyright and Related Rights
Subject matter of copyright protection; Ownership of copyright; Piracy and infringement and their remedies.

Unit III: Trademarks and Service Marks (10)
Introduction; Definitions; Signs which may serve as Trademarks; Criteria of protectability; Protection of Trademark Rights; Trademark piracy, counterfeiting and imitation of Labels and packaging; Trademark Licensing; Trade names; Franchising character; Merchandising.

Unit IV: IPR in Biotechnology (10)
Introduction; Adoption and dissemination; Need for protection, existing protection, traditional knowledge; GATT and TRIPS; Patenting of biological material; Patents of transgenic organisms; IPR for plant breeding; Plant variety protection and UPOV-1991; Biodiversity Bill-2002.

Reference Books:

1. Teece D., “Managing Intellectual Capital : Organizational, Strategic and Policy Dimensions”, Oxford University Press, 2005.
2. Intellectual Property Law in India Gogia Law Agency, Hyderabad by Narayan, P.S., 2000.
3. Carlos M., “Intellectual Property Rights, the WTO and Developing Countries : the TRIPS Agreement and Policy Options”, Zed Books, 2000.

BTY 005: Biopharmaceuticals

L T P: 3-1-0 **Credit: 4**

Unit I: History and Definition of Drugs **(10)**
Sources of drugs: plants, animals and microbes; Crude drugs: scope and importance; Classification (Taxonomical, Morphological); Role of biopharmaceuticals in treatment of various health disorders.

Unit II: Medicinal and Aromatic Plants **(10)**
Cultivation and utilization of medicinal and aromatic plants in India; Drugs obtained from roots, underground stems, barks, stems, leaves, flowers, fruits, seeds and entire plants.

Unit III: Methods of Drug Evaluation **(10)**
Morphological, microscopic, physical and chemical methods; Preliminary screening; Assay of drugs: biological evaluation/assays, microbiological methods; Chemical methods of analysis: chemical estimation, spectrophotometry and fluorescence analysis.

Unit IV: Alkaloids and Therapeutic proteins **(10)**
Glycosides, Tannins, Volatile Oils, Alkaloids, Flavinoids, Resins extraction methods and manufacturing practices; Production of therapeutic proteins, hormones, cytokines, interferon, interleukins, tumor necrosis factor (TNF).

Reference Books:

1. Evans W.C., “Trease and Evans’ Pharmacognacy”, Elsevier, 2009.
2. Zhang L. and Demain A.L., “Natural Products: Drug Discovery and Therapeutic Medicine”, 2010.
3. Walsh G., “Biopharmaceuticals : Biochemistry and Biotechnology”, Wiley, 2003.

BTY 006: Food Microbiology

L T P: 3-1-0 **Credit: 4**

Unit I: Historical Background **(8)**
History of microorganisms in food; Taxonomy, role and significance of microorganisms in foods; Intrinsic and extrinsic parameters of foods that affect microbial growth.

Unit II: Microbes in Food **(12)**
Microorganisms in fresh meats and poultry, processed meats, seafoods, fermented and non-fermented dairy products and miscellaneous food products; Probiotics and health benefits; Microbiological examination of surfaces, air sampling, metabolically injured organisms, enumeration and detection of food-borne organisms; Bioassay and related methods

Unit III: Food Preservation **(12)**
Food preservation using irradiation, characteristics of radiations of interest in food preservation; Principles underlying the destruction of microorganisms by irradiation; Physical and chemical methods of food preservation; Legal status of food preservation and role of FDA.

Unit IV: Storage **(8)**
Stable and clean packaging; Canning and different methods of canning; Consumer perspective and future of food biotechnology.

Reference Books:

1. Jay J.M., "Modern Food Micro-Biology" Aspen Publication, 2000.
2. Doyle M.P., Beuchat L.R. and Montville T.J., 'Food Microbiology: Fundamentals and Frontiers", ASM Press, 2001.
3. Lopez G.F.G., and Canovas G.V.B., 'Food Science and Food Biotechnology", CRC Press, 2003.

BTY 007: Proteomics

L T P: 3-1-0 **Credit: 4**

Unit I: DNA Microarray Technology (10)
Basic principles and design: cDNA and oligonucleotide arrays; Applications: Global gene expression analysis, comparative transcriptomics, differential gene expression; Genotyping/SNP detection; Detection technology; Computational analysis of microarray data.

Unit II: Structure Prediction (10)
Relationship between protein structure and function; Outline of a typical proteomics experiment; Identification and analysis of proteins by 2D analysis; Spot visualization and picking; Tryptic digestion of protein and peptide fingerprinting; Mass spectrometry: ion source (MALDI, spray sources); analyzer (ToF, quadrupole, quadrupole ion trap) and detector; Clinical proteomics and disease biomarkers; Prions; Proteins in disease.

Unit III: Protein-protein Interactions (10)
Solid phase ELISA; Pull-down assays (using GST-tagged protein); Far western analysis; Surface plasmon resonance technique; Yeast two hybrid system; Phage display; Protein interaction maps; Protein arrays-definition; Applications; diagnostics, expression profiling.

Unit IV: Applications (10)
Human disease genes; DNA polymorphism including those involved in disease; Hemoglobin and the anemias; Phenylketonuria (monogenic) and diabetes (multigenic) genetic disorders; SNP detection: hybridization based assays (allele specific probes); Proteomics and drug discovery; High throughput screening for drug discovery; Identification of drug targets; Pharmacogenomics and pharamacogenetics and drug development; Toxicogenomics; Metagenomics.

Reference Books:

1. Lesk A., “Introduction to Genomics”, Oxford University Press, 2008
2. Brown T.A., “Genomes”, Garland Science, 2006.
3. Campbell A.M. and Heyer L.J., “Discovering Genomics, Proteomics and Bioinformatics” Benjamin Cummings, 2007.

BTY 008: Molecular Plant Pathology

L T P: 3-1-0 **Credit: 4**

Unit I: Introduction to Plant pathology **(8)**
Introduction; Terms and concepts; Parasitism and disease development; Host-pathogen interaction; Disease cycle and epidemics.

Unit II: Plant Pathogens and Disease Development **(8)**
Significance of plant diseases and pathology; Plant pathogenic organisms: bacteria, virus, fungi, and symbionts.

Unit III: Molecular Biology of Pathogenicity **(12)**
Molecular basis of variability in pathogens; Pathogenicity related genes and mechanisms in pathogenic bacteria and fungi; Virus and Viroid genes involved in pathogenicity.

Unit IV: Molecular Genetics of Plant Disease Resistance **(12)**
Types of plant resistance to pathogens (R gene resistance, quantitative and monogenic); Basal and induced defense mechanisms; Pre-formed inhibitors of pathogens; Gene for gene interaction in plant defense; Systemic Acquired Resistance (SAR) and Induced Systemic Resistance (ISR); Recognition, mechanism and signal transduction during plant-pathogen interaction.

Reference Books:

1. Sambamurthy A.V.S.S., "A Textbook of Plant Pathology", I.K. International, 2006.
2. Agrios G.N., "Plant Pathology", Academic Press, 2005.
3. Sinclair W.A. and Lyon H.H., 'Diseases of Trees and Shrubs", Cornell University Press, 2005.

BTY 009: Pharmacognosy

L T P: 3-1-0 **Credit: 4**

Unit I: Drugs of Plant Origin **(8)**
Mutation, polyploidy and hybridization to improve the quality of vegetable drugs and their constituents; Chemical races; Nutraceutical: a biochemical background of use of herbal products, anthocyanins, proanthocyanidins, flavanones and resveratrol.

Unit II: Techniques of Initiation and Maintenance of Cultures **(12)**
Immobilized cell techniques; Germplasm storage; Biotransformation studies; Recent advances in elicitor techniques and production of biological active constituents in static, suspension, multiple shoot cultures; Biosynthetic potential of tissue cultures and factors affecting production of secondary metabolites by tissue culture techniques.

Unit III: Medicinal Activities **(10)**
Antibacterial, antiviral, hypolipidemic, anti-inflammatory, anti-malarial, hepatoprotective, antidiabetics and anticancer drugs from natural origin; Recent advances as reported in literature; Biological allergens and hallucinogens.

Unit IV: Marine Pharmacognosy **(10)**
Definition, present status, classification of important bioactive agents, their general methods of isolation and purification; Study of important bioactive agents including their chemistry and uses.

Reference Books:

1. Evans W.B., “Trease and Evans’ Pharmacognosy”, Saunders and Company, 2009.
2. Heinrich M., Barnes J., Gibbons S. and Williamson E.M., “Fundamentals of Pharmacognosy and Phytotherapy”, Churchill Livingstone, 2012.
3. Kar A., “Pharmacognosy and Pharmacobiotechnology”, Anshal Publishers, 2008.

BTY 010: Current Advances in Toxicology

L T P: 3-1-0 **Credit: 4**

Unit I: Concepts and Principles of Toxicology (10)
Fundamental concepts of toxicology; Cellular mechanisms of toxicity and protection; Biotransformation's role in toxicity; Major classes of toxic chemical agents; Necrotic, immune and neoplastic toxicology; Classification of toxins in humans; Risk assessment and regulatory toxicology and role of GLP in toxicology.

Unit II: Occupational Toxicology (10)
Methods and approaches to occupational toxicology; Hazard communication; Recent approaches to risk control; Occupational hygiene and exposure control; Development and documentation of Occupational Exposure Limits (OEL); Occupational diseases; Toxicologic evaluation of occupational agents.

Unit III: Toxicants Processing *in vivo* (10)
Absorption and distribution of toxicants; Metabolism of toxicants; Chemical and physiological influences on xenobiotic metabolism; Reactive metabolites and elimination of toxicants; Overview of systemic toxicology, reproductive toxicology and teratogenesis; Genetic toxicity and carcinogenicity; Determination of NOEL, NOAEL.

Unit IV: Toxicokinetics (10)
Concept of toxicokinetics, relationship to pharmacokinetics; One compartment model, two compartment model; Henderson-Hasselbach equation; Principles of detoxification; Plasma protein binding; Blood brain barrier; Application to clinical toxicology.

Reference Books:

1. Hodgson E., "A Textbook of Modern Toxicology", Wiley, 2004.
2. Barile F.A., "Clinical Toxicology Principles and Mechanisms", CRC Press, 2004.
3. Wright D.A. and Welbourn P., "Environmental Toxicology", Cambridge University Press, 2002.

BTY 011: Waste Management

L T P: 3-1-0 **Credit: 4**

Unit I: Solid Waste **(10)**

Public health and ecological impacts; Sources and types of solid wastes; Material flow and waste generation in a technological society; Factors affecting the generation rates, projections for futures, future challenges and opportunities; Functional elements: Waste generation, storage, collection, transfer and transport, processing and recovery, disposal.

Unit II: Composition, Storage and Collection **(10)**

Physical and chemical composition of municipal solid waste; Integrated solid waste management; Hierarchy of waste management options; Different methods for generation rates. **Storage:** movable bins, fixed bins. **Collection:** home to home collection, community bin system, theory and design of hauled container system, stationary container system.

Unit III: Landfilling **(10)**

Site selection criteria, landfill layout, landfill sections; Occurrence of gases and leachate in landfills: composition and characteristics, generation factors, initial adjustment phase, transition phase, acid formation phase, methane formation phase, maturation phase of gases and leachate.

Unit IV: Composting **(10)**

Types of composting, process description, design and operational consideration of aerobic composting, process description, design and operational consideration of anaerobic composting; Thermal conversion technologies: incineration and pyrolysis system; Energy recovery system; Electronic waste and biomedical waste; Overview of solid waste management practices in India.

Reference Books:

1. Letcher T. and Vallero D., “Waste: A Handbook for Management”, Academic Press, 2011.
2. Vaughn J., “Waste Management: A Reference Handbook”, ABC-CLIO, 2008.
3. “Manual on Municipal Solid Waste Management”, CPHEEO, Govt. of India.

Annexure-XXIII-B of Agenda Item no. 6.22

B.Tech.

COURSE STRUCTURE & SYLLABI
of
Ist Year

(with effect from academic session 2012-13)

School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Applied Sciences
School:	School of Engineering and Technology
Name of the Course:	B.Tech. (from 2012)
Duration:	Four (04) years
Total No. of Credits:	180 – 190
Date of meeting of BOS:	June 16, 2012
Status:	Approved by BOS and Faculty Board

Date of Meeting of Faculty Board: July 18, 2012

Status: Approved by BOS on 15 June 2012 and Faculty Board on July 18 2012

COURSE STRUCTURE

Sem.	COURSES						Course	L	T	P	Weekly Contact	Credits
I	Physics (3- 1 - 2) 5 or Chemistry (3- 0 - 2) 4	Principles of Electrical & Electronics Eng. (3 - 1 - 2) 5 or Basics of Computers & 'C' Programming (3 - 1 - 2) 5	Mathematics-1 (3 -1 - 0) 4 *Bio-Mathematics-1 *(3 -1 - 0) 4	Geo-Sciences (2-0-0) 2 Or Bio-Sciences (2 -0 - 0) 2	Manufacturing Practices (0-0-4) 2 or Graphic Science (1-0-4) 3	Language/ Foreign Language (2-0-2) 3 Or Env. Sc. (2-0-0) 2	6	13/14	3/2	10/8	26/24	21/ 20
II	Chemistry (3- 0 - 2) 4 or Physics (3 - 1 - 2) 5	Basics of Computers & 'C' Programming (3 - 1 - 2) 5 or Principles of Electrical & Electronics Eng. (3 – 1 – 2) 5	Mathematics – 2 (3 - 1 - 0) 4 * Bio-Mathematics-2 *(3 - 1 - 0) 4	Bio-Sciences (2 -0 - 0) 2 Or Geo-Sciences (2-0-0) 2	Graphic Science (1-0-4) 3 or Manufacturing Practices (0-0-4) 2	Env. Sc. (2-0-0) 2 Or Language/ Foreign Language (2 - 0 –2) 3	6	14/13	2/3	8/10	24/26	20/ 21

Total Credits- 41

PHY-109: Physics

LTP: 3-1-0 **Credits: 4**

UNIT-1: Relativistic Mechanics (11)

Inertial and non inertial frames, Michelson Morley experiment, postulates of special theory of relativity, Lorentz transformation, length contraction & time dilation, Doppler effect, twin paradox, addition of velocities, variation of mass with velocity, mass energy equivalence, relativistic momentum, relativity as bridge between electricity and magnetism (qualitative discussion only).

UNIT-2: Quantum Mechanics (9)

Wave particle duality, Davisson Germer experiment, uncertainty principle, introduction to quantum mechanics, wave function, conditions necessary for physically acceptable wavefunction, Schrödinger equation (time independent form), particle in a box (infinite potential well).

UNIT-3: Lasers and Applications (11)

Laser: Basic principle, induced absorption, spontaneous emission and induced emission, Einstein's coefficients, construction and working of ruby, He-Ne and semiconductor laser, spatial and temporal coherence, characteristics and applications of lasers.

Optical Fiber: Basic idea and construction, types of fibers, acceptance angle and cone, numerical aperture, propagation mechanism and communication in optical fiber, attenuation and signal loss in optical fiber, qualitative description of pulse broadening, advantages and applications of optical fibers.

Holography: Basic principle of holography, construction and reconstruction of image on hologram and applications of holography.

UNIT-4: Electromagnetism (9)

Review of Gauss' laws, Faraday's law and modified Ampere's law, Maxwell's equations, conservation of charge and energy, propagation of electromagnetic waves in vacuum and in matter, speed and transverse nature of electromagnetic waves (in vacuum only), polarization of electromagnetic waves, reflection and transmission (normal incidences only).

Text Books:

1. Beiser, Arthur, "Concepts of Modern Physics", Tata McGraw-Hill.
2. Griffiths, David J., "Introduction to Electrodynamics", Prentice-Hall.

Reference Books:

3. Tiwari, K.K., "Electricity and Magnetism", S. Chand and Sons.
4. Thyagarajan, K. and Ghatak, A.K., "Lasers (Theory and Application)",
5. Ghatak, A.K. and Thyagarajan, K., "Introduction to fiber",
6. Senior, John M., "Optical fiber communications",

CHY-105: Chemistry

LTP: 3-0-0 **Credits: 3**

UNIT-1: Thermodynamics and Electrochemistry (12)

Thermodynamics*:* Statistical concept of entropy, free energy, chemical equilibria, and chemical potential

Electrochemistry : Electrochemical cells, galvanic cells, general equation for emf of cells, electrode potentials and its relevance to oxidation and reduction, measurement of EMF, determination of pH, dry cells, fuel cells and storage battery.

Metallic Corrosion: Types of corrosion, mechanism of corrosion, galvanic corrosion, and principle of corrosion control.

UNIT-2: Water and water treatment (10)

Water: Water quality parameters - definition and expression, estimation of hardness (EDTA method) and alkalinity (Titrimetry)

Water treatment: Domestic water treatment and industrial water treatment- water softening (zeolite), demineralization (ion- exchangers) and desalination (RO).

UNIT-3: Stereoisomerism (8)

Overview of concepts, configuration, Fischer and Newman projections, conformations-conformations around a C-C bond in acyclic compounds, optical isomerism of compounds containing one and two asymmetric C-atoms and of compounds without asymmetric carbon atom (allenes, spiro compounds, etc.), geometrical isomerism - concept, E and Z nomenclature.

UNIT-4: Solid State Chemistry (10)

Types of unit cell, space lattice (only cubes), Bragg's Law, calculation and density of the unit cell, one and two dimensional solids such as graphite and its conduction properties, other states of matter including liquid crystallite state, classification (thermotropic and iyotropic with examples, types of mesophases – nematic, chiral nematic (cholesteric), smectic and columnar – arrangements of molecules with examples) and applications of liquid crystals.

Text and Reference Books:

1. Glasstone, S., "Text Book of Physical Chemistry", Macmillan and co. ltd.
2. Atkins, P., "Elements of Physical Chemistry", Oxford University Press.
3. Puri, B.R., Sharma, L.R., and Pathania, M.S., "Principles of Physical Chemistry", Vishal publishing company.
4. Collings, P.J., "Liquid Crystals", Princeton University Press.
5. Kalsi, P.S., "Stereochemistry conformation and mechanism", New Age International.
6. Eliel, E.L., and Willer, S.H., "Stereochemistry of Organic Compounds", John Wiley and Company.

EVS-102: Environmental Sciences

LTP: 2-0-0 **Credits: 2**

UNIT-1: Nature of Environmental Studies, Natural Resources and Associated Problems (12)

- Multidisciplinary nature of environmental studies- definition, scope and importance, need for public awareness.
- Natural resources: use and over exploitation of

  a. Forest Resources: Deforestation, timber extraction, mining, dams and their effects on forest and tribal people.

  b. Water Resources: Surface and ground water, floods, drought, conflicts over water.

  c. Mineral Resources: Environmental effects of extracting and using mineral resources.

  d. Food Resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity.

  e. Energy Resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.

  f. Land Resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Environmental impact assessment; life cycle assessment; trade, environment and development; environmental management systems and ISO certification; control policies, legislations and acts.

UNIT-2: Environmental Pollution (10)

- Definition, cause, effects and control measures of air pollution; water pollution; soil pollution; marine pollution; noise pollution; thermal pollution; nuclear hazards.
- Solid waste management: Causes, effects and control measures of urban and industrial wastes.
- Excursion tour to specific sites to understand environmental problems.

UNIT-3: Social Issues and the Environment (8)

- From unsustainable to sustainable development.
- Water conservation, rain water harvesting, watershed management.
- Resettlement and rehabilitation of people; its problems and concerns.
- Overview of climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.
- Population explosion.
- Public awareness.
- One day activity(involving all the students of university if possible)

Reference books:

1. Miller, G.T., "Introduction to Environmental Science", Cengage Learning.
2. Rao, P.V., "Principles of Environmental Science and Engineering", Prentice Hall of India.
3. Joseph, Benny, "Environmental Studies", Tata Mcgraw-Hill.
4. De, A.K., "Environmental Chemistry", New Age Int. Publ.
5. Davis M. L. and Cornwell D. A., "Introduction to Environmental Engineering", McGraw-Hill.

MTH-112: Mathematics – 1

LTP: 3-1-0 **Credits: 4**

UNIT-1: Calculus I (20)

Differential Calculus

Limit, continuity and differentiation of functions of two variables, Euler's theorem and its applications, total differentiation, Jacobians, Taylor's expansion of functions of one and more variables, maxima and minima of functions, Lagrange method of undetermined multipliers.

Integral Calculus

Riemann integral, differentiation under integral sign, Beta and Gamma functions. coordinate system: Cartesian, polar, cylindrical and spherical, double integration, change of order of integration and change of variables, line, surface and volume integrals.

UNIT-2: Differential Equations I (15)

Review of first order equations, linear differential equation with constant coefficients, second order linear differential equations, Cauchy- Euler form, variation of parameters, series solutions, some idea about Bessel and Legendre equations and applications, initial and boundary value problems for second order ODE.

UNIT-3: Fourier Series (5)

Fourier series, even and odd functions, convergence, change of interval, half range series, applications.

Text Books:

1. Kreyszig, E., "Advanced Engineering Mathematics", John Wiley & Sons Inc.
2. Jain, M.K., and Iyengar, S.R.K., "Advanced Engineering Mathematics", Narosa Publications.

Reference Books:

3. Thomas, B.G., and Finny R.L., "Calculus and Analytical geometry", Pearson Education Asia, Adison Wisley.
4. Simmons, G.F., "Differential Equations with applications with applications", Tata McGraw-Hill.
5. Ross, "Differential Equations", Springer Verlag.

MTH-113: Mathematics – 2

LTP: 3-1-0 **Credits: 4**

UNIT-1: Vector Calculus **(15)**

Vector differentiation, Simple curves: Spiral, helix, cycloid.

Vector and scalar fields, gradient, divergence, curl and their physical interpretations, line, surface, and volume integrals in vector forms, Gauss divergence and Stokes theorems (without proof), Green's theorem in a plane.

UNIT-2: Differential Equations II **(15)**

Formulation & classification of partial differential equations, solution of partial differential equations, method of separation of variables, wave equation, heat equation

UNIT-3: Laplace Transform **(10)**

Transforms of elementary functions, properties, transform of df/dt, ∫f(t)dt, tf(t), f(t)/t, unit step and unit impulse functions, convolution theorem, inverse Laplace transformation, applications.

Text Books:

1. Kreyszig, E., "Advanced Engineering Mathematics", John Wiley & Sons Inc.
2. Jain, M.K., and Iyengar, S.R.K., "Advanced Engineering Mathematics", Narosa Publications.

Reference Books:

3. Thomas, B.G., and Finny R.L., "Calculus and Analytical geometry", Pearson Education Asia, Adison Wisley.
4. Ross, "Differential Equations", Springer Verlag.

MTH-114: BioMathematics – 1

LTP: 3-1-0 **Credits: 4**

UNIT-1: Matrices (10)

Review of elementary properties of determinants and matrices, Solution of a system of equations, Eigen values and vectors, diagonalization, quadratic equations.

UNIT-2: Differential Calculus (10)

Limit, continuity and differentiation of functions of two variables, Euler's theorem and its applications, total differentiation, Jacobians, Taylor's expansion of one and more variables, maxima and minima of functions.

UNIT-3: Integral Calculus (10)

Rieman integral, differentiation under integral sign, Beta and Gamma functions, coordinate system: Cartesian, Polar, cylindrical and spherical, double integration, change of order of integration and change of variables, line, surface and volume integrals.

UNIT-4: Laplace Transform (10)

Transforms of elementary functions, properties, transform of df/dt, $\int f(t)dt$, tf(t), f(t)/t, unit step and unit impulse functions, inverse Laplace transformation, applications.

Text Books:

1. Kreyszig E., "Advanced Engineering Mathematics", John Wiley & Sons Inc.
2. Jain, M.K., and Iyengar, S.R.K., "Advanced Engineering Mathematics", Narosa Publications.

Reference Books:

3. Lipshutz, S., and Lipsom, M., "Linear algebra", Schaum series.
4. Thomas, B.G., and Finny, R.L., "Calculus and Analytical geometry", Pearson Education Asia, Adison Wisley, New Delhi.

MTH-115: BioMathematics – 2

LTP: 3-1-0 **Credits: 4**

UNIT-1: Vector Calculus (10)

Vector and scalar fields, gradient, divergence, curl and their physical interpretations, line, surface and volume integrals in vector forms, Gauss divergence and Stokes theorems (without proof), Green's theorem in a plane.

UNIT-2: Introduction to Complex Analysis (10)

Complex numbers, limit and continuity, differentiability, analytic functions, C-R equations, harmonic functions, complex integration, Cauchy's theorem, Cauchy integral formula, zeros and singularities, Taylor's and Laurent's series, calculus of residues, residue theorem.

UNIT-3: Differential Equation (10)

Review of first order equations, linear differential equation with constant coefficients, second order linear differential equations, Cauchy-Euler form, variation of parameters, series solutions, initial and boundary value problems for second order ODE, formulation and classification of partial differential equations, solution of partial differential equations, method of separation of variables.

UNIT-4: Infinite Series (10)

Convergence, divergence, comparison test, ratio test, Cauchy's n^{th} root test, Leibnitz's test (without proof), absolute and conditional convergence, Taylor and Meclaurin series, power series, radius of convergence.

Text Books:

1. Kreyszig E., "Advanced Engineering Mathematics", John Wiley & Sons Inc.
2. Jain, M.K., and Iyengar, S.R.K., "Advanced Engineering Mathematics", Narosa Publications.

Reference Books:

3. Brown, J.W ., and Churchill, R.V., "Complex Variables and Applications", Mcgraw-Hill.
4. Simmons, G.F., "Differential Equations with applications with applications", Tata McGraw-Hill.

Principles of Electrical & Electronics Engineering

L -T -P: 3-1-2 **Credits: 5**

UNIT 1: Network Analysis (6)

Series, parallel and series-parallel circuits, voltage and current division rules, application of Kirchhoff's laws, node voltage and mesh current methods of circuit analysis, dc network theorems, introduction to ac circuits.

UNIT 2:A.C. Power Generation and Distribution (3)

Introduction to generation, transmission and distribution of electric power, residential wiring, circuit protective devices and safety precautions, efficient and safe use of electricity.

UNIT 3: Magnetism, Magnetic circuits and Transformers (8)

Magnetic circuits, comparison of magnetic and electric circuits, basic principle; constructional details, emf equation, efficiency, voltage regulation and applications of Transformer.

UNIT 4: Rotating Machines (8)

Principle of electromechanical energy conversion, basic principle, constructional details, types, characteristics and applications of dc machines; 3- phase and 1- phase induction machines, introduction to synchronous machines.

UNIT 5: Measurement of Electrical Quantities (4)

Moving iron and moving coil meters for voltage and current measurement, electrodynamometer type wattmeter, induction-type energy meter.

UNIT 6: Semiconductor Electronics (4)

Metals, semiconductors and insulators; electrons and holes in intrinsic semiconductor, donor and acceptor impurities; n-type and p-type semiconductor.

UNIT 7: Diodes and Transistors (4)

Diodes: PN junction V-I characteristics, diode resistance and capacitance, diode ratings and applications, rectifiers, **Bipolar Junction Transistors**: Basic construction, transistor action, CB,CC and CE configurations, input output characteristics, Biasing of transistors - fixed bias, emitter bias

UNIT 8: Number system and logic Gates (3)

Number system, conversion of bases, Boolean algebra, logic gates, Introduction to microprocessors.

Reference Books:

1. V. Del Toro, "Principles of Electrical Engineering" Prentice Hall, 1968
2. D.E. Fitzgerald & A.Grabel Higginbotham, "Basic Electrical Engineering" McGraw Hill, 1981
3. Mac Elwyn Van Valkenburg, "Network Analysis" Prentice Hall, 2006
4. Boylestad, "Electronic devices and circuit theory" Pearson Education India, 2009
5. M.Morris Mano, "Digital Logic and Computer Design" Pearson Education, 1979
6. Millman & Halkias, "Integrated Electronics" TATA McGraw Hill, 1995
7. John Hiley, Keith Brown and Mckenzie Smith; "Hughes Electrical and Electronic Technology" Pearson Education, 2008

Principles of Electrical and Electronics Engineering
List of Experiments

1. To Study of various measuring instruments namely (ammeter, voltmeter, wattmeter, Energy meter, Multimeter etc).
2. To Measure current, voltage and power in dc and ac circuits.
3. To verify Kirchhoff's laws.
4. To establish voltage, current relationship in an R-L circuit.
5. To start a dc motor, reverse its direction of rotation and measure current- voltage and Power.
6. To start a 3-phase induction motor reverse its direction of rotation and measure power and power factor.
7. To start and reverse the direction of rotation of a single phase induction motor.
8. To study the tube light circuit and stair case lighting circuit.
9. To calculate the efficiency of a transformer by OC and SC tests.
10. To study voltage/current characteristic of forward-biased diode.
11. To make and test half wave and full wave rectifier circuits
12. To analyze the truth tables of various basic digital gates.
13. To study the input/output characteristics of BJT.

Principles of Electrical and Electronics Engineering
List of Experiments

14. Measure current, voltage and power in dc and ac circuits.
15. To verify Kirchoff's laws.
16. To establish voltage, current relationship in an R-L circuit.
17. To start a dc motor and reverse its direction of rotation.
18. To start a 3-phase induction motor and reverse its direction of rotation.
19. To start and reverse the direction of rotation of a single phase induction motor.
20. To study the tubelight circuit and stair case lighting circuit.
21. To calculate the efficiency of a transformer by OC and SC tests.
22. To study voltage/current characteristic of forward-biased diode.
23. To make and test half wave and full wave rectifier circuits
24. To analyse the truth tables of various basic digital gates.
25. To study the input/output characteristics of BJT and FET.
26. Study of various measuring instruments (ammeter, voltmeter and wattmeter).

CMP-104: Basics of Computer & 'C' Programming

L T P : 3-1-0 **Credit: 4**

UNIT 1: Fundamentals of Computer **(8)**

Computer: Introduction, Computer generations, Components of PC, Classification of computers and storage devices.
Software: Introduction and types of software, Overview of operating system.
Computer languages: Introduction and generation of languages, Translators.
Number system: Binary, Decimal, Octal and Hexadecimal

UNIT 2: Algorithms **(10)**

Flowchart: Components of flowcharts, Design of flowchart for various problems.
Algorithm: Definition, Characteristics, Development and uses of algorithms, Recursive algorithms.
Pseudo code: Definition and use.
Elements of C: History, Introduction to C programming language, Structure of a C program, Compilation and execution of C program, Data types, Variables, Constants, Identifiers and keywords, Storage classes, Operators and expressions, Enumerations, Macros, C Preprocessor**, C**ontrol statements and loops.

UNIT 3: Arrays **(6)**

One dimensional and multi dimensional arrays: Declaration, Initialization and array manipulation, Array as parameters.
Functions: Definition, Function declaration, Types of functions, Function call, Parameter passing: Call by value, Call by reference, Recursive and string handling functions.

UNIT 4: Strings **(8)**

Strings**:** Initializing, Assigning values to strings, Converting strings to other types, Library functions for string manipulation.
Pointers: Pointers & addresses, Pointers & arrays, Pointers & function arguments, Address arithmetic, Character pointers and functions, Pointers to pointer and array of pointers.

UNIT 5: Structures & Unions **(8)**

Structure and Union: Definition, Initialization and assignment of structures, Unions.
File handling: Creating a data file, Opening and closing a data file, Various I/O operations on data files.

Text Books:

1. P K Sinha, "Computer Fundamentals", BPB
2. Balagurusamy, E programming in ANSI C 2/e, TMH

Reference Books:

1. Complete Reference 'C', Herbert Schildt, BPB Publications.
2. A book on C, Era Pohl and Kelly, Pearson Education.
3. Kanetkar, Yashvant, Let Us C, 4/e, BPB publications.

Geo Science

L-T-P (2-0-0) **Credits :2**

UNIT I: Introduction **(5)**

Earth, its place in Solar System, physical features of its surface, other basic features (mass, shape, size, density, etc.) and Earth's interior.

UNIT II **(5)**

Rocks and Minerals, gems and gemstones; Volcanoes, earthquakes and tsunami, glaciers, landslides, mudflows and avalanches;

UNIT III **(4)**

Evolution of the Earth through ages; Mineral Exploration and Geophysical Exploration;

UNIT IV **(5)**

Groundwater; Groundwater recharge and management of groundwater;

UNIT V **(5)**

Hydrocarbons and coal; Rock Deformation, Mining and Tunnelling;

UNIT VI **(2)**

Geological Divisions of India.

Text Books:

1. Press F. and Siever R., "Understanding the Earth", W.H. Freeman & Co.
2. Gass I. G., Smith P.J. and Wilson R. C. L., "Understanding the Earth", ELBS
3. Moore J. S. and Wicander R., " Physical Geology", Brooks/Cole Pacific Grove ,CA
4. Willam L., " Fundamentals of Geophysics",Cambridge University Press

BTY 108: Bio-Sciences

L T P: 2-0-0 **Credit: 2**

Unit I: Biological Systems **(7)**

Characteristics of living organisms; Cell as a basic unit of life; Structure of Prokaryotic and Eukaryotic cell; Theories of Evolution; Mendel's law of Inheritance; Variation and Speciation.

Unit II: Carbohydrates and Lipids **(7)**

Definition, Classification, Structure and Functions of Carbohydrates and Lipids; Different types of Carbohydrates and Lipids.

Unit III: Proteins **(7)**

Amino acids: Classification and Structure; Proteins: primary, Secondary, Tertiary and Quaternary Structure and functions.

Unit IV: Nucleic Acids
(7)

Nucleotides and Nucleic acids; Evidence of nucleic acid as Genetic material; Structure and Functions of DNA; Flow of Genetic material; Central Dogma.

Reference Books:

1. Starr C. and Taggard R., "Cell Biology and Genetics", Thomson Learning, 2001.
2. Nelson D.L. and Cox M.M., "Lehninger Principles of Biochemistry", W. H. Freeman, 2004.
3. Smith J.E., "Biotechnology", Cambridge University Press, 2003.

MANUFACTURING PRACTICES

L T P: 0-0-4 **Credits: 2**

UNIT 1: Workshop Layout and Safety (1)
Introduction to layout and its importance, Machine guard, Safe lifting heavy materials, Safe use of machine Tools, Wearing a safety dress, Safety shoes, Safety goggles, Correct behaviour.

UNIT 2: Carpentry (3)
Use and setting of hand tools like hacksaws, jack planes, chisels and gauges for construction of various joints, wood turning, and modern wood turning methods; One carpentry job involving a joint,Cross-lap joint, Corner-lap joint, Dovetail joint ,Bridle joint.

UNIT 3: Casting and Forging (2)
Principles & types of casting, General casting practices, Introduction to smithy tools and their uses, Smithy Practice(forging): Smithy operation such as offsetting, drawing, bending; Jobs to be made: Chisel ,Ring, Punch, Screw Driver, Lifting hook ,Handle.

UNIT 4: Fitting (2)
Use and setting of fitting tools for chipping, cutting, filing, marking, centre punching, tapping drilling, One job involving following operations: Filing to size one simple male-female joint, drilling and tapping.

UNIT 5: Welding Shop (3)
Introduction to welding, brazing and soldering processes and their applications, Electrodes: constituents and functions of electrode coating, welding positions, Edge preparation for welding jobs, Arc welding for different job like Lap welding of two plates, butt welding of plates with simple cover, arc welding to join plates at right angles.

UNIT 6: Machine Shop (7)
Centre Lathe Machine: Introduction to centre lathe, types of lathes. (capstan and turret), Construction and working of lathe, attachments and accessories, lathe mechanisms, Thread cutting and taper turning methods, Simple numerical on calculation of machining time, To prepare a job on a lathe involving facing, outside turning, taper turning, step turning, radius making and parting-off.

Milling, Drilling, Shaper and Boring Machines: Milling machine: Types of milling, Construction, Working and Mechanism of Column and Knee types milling machine. Cutter-types and geometry and their application, Speed, feed and depth of cut. Simple numerical to calculate machining time. Universal Dividing head, methods of indexing- Simple, Compound, Differential. Only simple numerical on indexing. Drilling Machine: Twist drill geometry, tool holder, Types of drilling machine, Types of drills and operations, speed, feed of drill, Simple numerical to calculate machining time. Introduction to shaper and boring machines. To prepare a job involving side and face milling on a milling machine. To prepare horizontal surface/vertical surface/ slots or V-grooves on a shaper.

Grinding Machines: Abrasive machining process machines – types, construction and operation. Grinding wheel –designation, mounting and dressing of grinding wheels. Super finishing processes - honing, lapping, buffing and burnishing. To prepare a single point

cutting tool on grinding machine.

UNIT 7: Sheet Metal Working Shop: (2)

Use of sheet metal, working hand tools, cutting, bending, spot welding. Jobs to be made: funnel, tray etc.

Textbooks and References:

1.Chapman W. A. J. *Workshop Technology* Vol I, II, III, ELBS Publishers
2.Degarmo, Black and Kosherth, Materials and Processes in Manufacturing, 8th Edition, PHI
3.Rao P N; Manufacturing Technology, Vol.1 & 2, TMH
Elements of Workshop Technology, Vol-I & II, Hazra Choudhari, Media Promo. &Pub. Pvt
4.Course in Workshop Technology, B.S. Raghuwanshi, Dhanpat Rai &Sons

GRAPHIC SCIENCE

L T P: 1-0-4 **Credits: 3**

UNIT-1:

Introduction: Drawing Instruments and Accessories and Their Uses, BIS Standards, Lettering, Dimensioning, Lines

Geometrical Constructions: To divide a Line, To construct Regular Polygons-Pentagon, Hexagon, Heptagon, Octagon, Conic Sections, Tangent & Normal to Conic Sections, Cycloidal Curves, Spirals, Involutes, Helixes

Scales: Representative Fraction, Types of Scales- Plain, Vernier, Diagonal, corresponding Scales. Construction of Scales.

UNIT-2:

Orthographic Projections: Introduction, Projection Systems, Projection Methods, Principal Planes, Reference Line, Conventions Employed, Orthographic Views

Orthographic Projection of Points: Introduction, Notation System, Projection of Points in all the Four Quadrants

Orthographic Projection of Lines: Projections of Straight Lines located in the First and Third Quadrant, True and Apparent Lenghts, True and Apparent Inclinations to the Reference Planes, Traces of a Line

Projections of Points, Lines and Planes on Auxiliary Planes : Introduction, Concept of Auxiliary Plane Projection Method, True Length, True Inclinations and Traces of a Line and a Plane, Distance of a Point from a Line, Distance between two skew Lines.

Orthographic Projection of Planes: Introduction, Definitions, Projection of Plane Surfaces - Triangle, Square, Rectangle, Rhombus, Pentagon, Hexagon and Circles in different Positions by Change of Position Method Only

Orthographic Projection of Solids: Introduction, Definitions, Basic Solids, Frustum and Truncated Solids, Projections of Right Regular- Tetrahedron, Hexahedron, Prism, Pyramid, Cylinder and Cone in Different Positions

UNIT-3:

Sections and Development of Lateral Surfaces of Solids: Introduction, Theory of Sectioning, Section Planes, Sectional Views, Sections of Prisms, Sections of Pyramids, Sections of Cylinders, Sections of Cones, Development of Lateral Surfaces of Cylinders, Cones, their Frustums and Truncations.

Intersection of Surfaces : Cases of Intersection, Theory of Intersection, Lines of Intersection and Methods of determining Lines of Intersection of two Interpenetrating Solids, Intersections of two Prisms.

UNIT-4:

Isometric Projection: Introduction, Isometric Scale, Isometric Views and Isometric

Projections, Isometric Views of Simple Plane Figures, Isometric Views of Cubes, Right Circular Cylinder, Right Circular Cones.

UNIT-5:

Introduction to Computer Aided Sketching: Computer Screen, Layout of the Software, Standard Tool Bars/ Menus, and Description of Most Commonly Used Tool Bars, Creation of 2D/ 3D Environment, Selection of Drawing Size and Scale, Commands and Creation Creation of Lines, Co-ordinate Points, Axes, Poly-lines, Square, Rectangle, Polygons, Splines, Circles, Ellipse, Text, Move, Copy, Offset, Mirror, Rotate, Trim, Extend, Break, Chamfer, Fillet, Curve Constraints, viz. Tangency, Parallelism, Inclination and Perpendicularity, Dimensioning, Line Convention, Material Conventions and Lettering.

Textbooks and References:

1. Engineering Drawing with an Introduction to AUTO-CAD, Dhananjay A Jolhe, TATA McGraw Hill
2. Elementary Engineering Drawing, N.D. Bhatt

FRENCH - I

L-T-P: 1-0-2 **Credits: 2**

Course Objective:

To familiarize the students with the French language
- with the phonetic system
- with the syntax
- with the manners
- with the cultural aspects

Course Contents:

Module A: pp. 01 to 37: Unités 1, 2, Unité 3 Object if 1, 2 **(4)**
Only grammar of Unité 3: object if 3, 4 and 5

Contenu lexical: Unité 1: Découvrir la langue française: (oral et écrit) **(4)**
1. se présenter, présenter quelqu'un, faire la connaissance des autres, formules de politesse, rencontres
2. dire/interroger si on comprend
3. Nommer les choses

Unité 2: Faire connaissance **(4)**
1. donner/demander des informations sur une personne, premiers contacts, exprimer ses goûts et ses préférences
2. Parler de soi: parler du travail, de ses activités, de son pays, de sa ville.

Unité 3: Organiser son temps **(4)**
1**.** dire la date et l'heure

Contenu grammatical: **(4)**
1. organisation générale de la grammaire
2. article indéfini, défini, co
3. nom, adjectif, masculin, féminin, singulier et
4. négation avec « de », "moi aussi", "moi non plu
5. interrogation: Inversion, est-ce que, qui, que, quoi, qu'est-ce que, où, quand, comment, quel(s), quelle(s) Interro-négatif: réponses: oui, si, n
6. pronom tonique/disjoint- pour insister après une préposition
7. futur proche

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:
- le livre à suivre : Campus: Tome 1

GERMAN - I

L-T-P: 1-0-2 **Credits: 2**

Course Objective:
To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.

To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Course Contents:

Module I: Introduction (2)
Self introduction: heissen, kommen, wohnwn, lernen, arbeiten, trinken, etc.
All personal pronouns in relation to the verbs taught so far.
Greetings: Guten Morgen!, Guten Tag!, Guten Abend!, Gute Nacht!, Danke sehr!, Danke!, Vielen Dank!, (es tut mir Leid!),
Hallo, wie geht's?: Danke gut!, sehr gut!, prima!, ausgezeichnet!,
Es geht!, nicht so gut!, so la la!, miserabel!

Module II: Interviewspiel (2)
To assimilate the vocabulary learnt so far and to apply the words and phrases in short dialogues in an interview – game for self introduction.

Module III: Phonetics (4)
Sound system of the language with special stress on Dipthongs

Module IV: Countries, nationalities and their languages (2)
To make the students acquainted with the most widely used country names, their nationalitie and the language spoken in that country.

Module V: Articles (2)
The definite and indefinite articles in masculine, feminine and neuter gender. All Vegetables, Fruits, Animals, Furniture, Eatables, modes of Transport

Module VI: Professions (2)
To acquaint the students with professions in both the genders with the help of the verb "sein".

Module VII: Pronouns (2)
Simple possessive pronouns, the use of my, your, etc.
The family members, family Tree with the help of the verb "to have"

Module VIII: Colours (1)
All the color and color related vocabulary – colored, colorful, colorless, pale, light, dark, etc.

Module IX: Numbers and calculations – verb "kosten" (1)
The counting, plural structures and simple calculation like addition, subtraction, multiplication and division to test the knowledge of numbers.
"Wie viel kostet das?"

Module X: Revision list of Question pronouns (1)
W – Questions like who, what, where, when, which, how, how many, how much, etc.

Examination Scheme:

Components	**CT1**	**CT2**	**C**	**I**	**V**	**A**
Weightage (%)	20	20	20	20	15	5

C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1, 2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

ENGLISH BRIDGE COURSE (International students)

Course objective:
To equip students to face the linguistic challenges in a different atmosphere
Help students to understand different accents and standardise their existing English
Guide the students to hone the basic communication skills, listening, speaking reading and writing.

Module 1
Listening Skills

- Everyday Business Communication
- Communicating Internationally
- Listening comprehension, summarizing & paraphrasing
- Cross cultural communication

Module 2
Speaking Skills

- Communicating with people from diverse backgrounds, understanding different accents and cultural aspects
- Tellephone ettiquetttes, netiquettes
- Meetings (how to conduct meetings)
- Presentations & Conferences
- Interviews, group discussions
- Pronunciation drills & vocabulary practice

Module 3
Writing Skills

- Grammar refresher: subject- verb agreement, avoiding common errors
- Vocabulary building for Business writing
- Writing for specific purposes
- Structure and organisation of a written text
- Writing effectively
- Written Business communication, inter office conversation

Module 4
Practical

- Reading comprehension
- Picture description
- Movie review
- Book review
- Basic translations .(Translating a native poem or a short story into English)
- Role playing

Annexure-XXIII-C of Agenda Item no. 6.22

B.Tech.

in

Biotechnology

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Biotechnology
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Biotechnology	
School:	School of Engineering and Technology	
Name of the Course:	B.Tech. in Biotechnology	
Duration:	Four Years	
Total number of Credits:	183	
Date of Meeting of BOS:	June 16, 2012 and July 12, 2012	
Members of BOS:	1. Dr. Simendra Singh, HOD	Chairman
	2. Dr. V. K. Baranwal, IARI, New Delhi	Ext. Member
	3. Dr. V. K. Tiwari	Ext. Member
	4. Prof. Rita Singh	Int. Member
	5. Dr. Shahana Majumder	Int. Member
	6. Dr. Pankaj Kishor Mishra, Asstt. Professor	Int. Member
	7. Mrs. Rashmi Pandita, Asstt. Professor	Int. member
	8. Mrs. Monika Jain, Asstt. Professor	Int. Member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

COURSE STRUCTURE

B.Tech. in Biotechnology 2nd year onwards

Semester	COURSES						Course	L	T	P	Weekly Contact	Credits
III	Cell Biology (3-0-2) 4	Instrumentation and Bioanalytical Techniques (3-0-2) 4	Genetics (3-1-0) 4	Mathematics BT-3 (3-1-0) 4	Department Elective-I (3-1-0) 4	Managerial Economics/ Business Communication (3-0-0) 3	6	18	3	4	25	23
IV	Biochemistry (3-1-2) 5	Microbiology (3-0-2) 4	Immunology (3-1-0) 4	Department Elective-II (3-1-0) 4	Department Elective-III (3-1-0) 4	Business Communication/ Managerial Economics/ (3-0-0) 3	6	18	4	4	26	24

Semester	COURSES						Course	L	T	P	Weekly Contact	Credits
V	Bioprocess Engineering (3-1-2) 5	Molecular Biology (3-1-2) 5	Computational Biology (3-1-0) 4	OOPS programming using C++ (3-0-2) 4	Management Concepts & Practices/ Technical Communication (3-0-0) 3	Open Elective-I (4-0-0) 4	6	19	3	6	28	25
VI	Plant Biotechnology (3-0-2) 4	Recombinant DNA Technology (3-0-2) 4	Animal Biotechnology (3-1-0) 4	Department Elective-IV (3-1-0) 4	Technical Communication/ Management Concepts & Practices (3-0-0) 3	Open Elective-II (4-0-0) 4	6	19	2	4	25	23
	Summer Training						-	-	-	-	-	02

Semester	COURSES						Course	L	T	P	Weekly Contact	Credits
VII	Downstream Processing (3-0-2) 4	Stem Cells (3-0-0) 3	Department Elective-V (3-1-0) 4	Department Elective-VI (3-1-0) 4	Open Elective-III (4-0-0) 4	Project (2)	5	16	2	2	20	21
VIII	Bioethics and Intellectual Property Rights (3-0-2) 4	Department Elective-VII (3-1-0) 4	Business Law and Ethics (3-0-0) 3	Open Elective-IV (4-0-0) 4	Project (8)		4	13	1	2	16	23
						TOTAL CREDIT (Including 1st Year)						**183**

LIST OF DEPARTMENTAL ELECTIVES

1. Intermediary Metabolic Pathway
2. Waste Management
3. Dairy Technology
4. Food Microbiology
5. Enzymology
6. Virology
7. Biophysics
8. Biochemical Engineering
9. Genes and Genomes
10. Molecular Plant Pathology
11. Biopharmaceuticals
12. Toxicology
13. Bio-nanotechnology
14. Bioinformatics

LIST OF OPEN ELECTIVES

Nil

B. Tech.

in

Civil Engineering

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Civil Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Civil Engineering	
School:	School of Engineering and Technology	
Name of the Course:	B.Tech. in Civil Engineering	
Duration:	Four years	
Total number of Credits:	190	
Date of Meeting of BOS:	July 25, 2012	
Members of BOS:	1. Prof. Satyaprakash, HOD, Civil	Chairman
	3. Prof. Ranvir Singh, DSW, Sharda	Int. Member
	4. Prof. R.L. Misri, Civil	Int. Member
	5. Prof. A.M. Chandr , Civil	Int. Member
	6. Prof. D. Goldar, Civil	Int. Member
	8. Mr. Gaurav Goel, Civil	Int. Member

Date of Meeting of Faculty Board:

Status: Approved by BOS and Faculty Board

COURSE STRUCTURE
B.Tech. in Civil Engineering

SEMISTER	Courses (L-T-P)						L. Course	Contact Hr/ Week				Credits
								L	T	P	Total	
III	Mathematics-3 (3-1-0) 4 or Managerial Economics (3-0-0) 3	Mechanics of Deformable solids (3-1-2) 5	Fluid Mechanics (3-1-2) 5	OOPS Programming using C++ (3-1-2) 5	Dept. Elective-1 (3-1-2) 5	Business Communication (3-0-0) 3	**6**	**18**	**4**	**8**	**30**	**26**
IV	Design of Concrete Structures (3-1-2) 5	Mathematics-3 (3-1-0) 4 or Managerial Economics (3-0-0) 3	Principles of Surveying (3-0-2) 4	Engg. Dynamics (3-1-0) 4	Costing, Estimation & Building drawing (3-1-2) 5	Building Materials Technology (3-1-2) 5	**6**	**18**	**5**	**8**	**31**	**27**
V	Open Elective-1 (3-0-2) 4	Hydrology (3-1-0) 4	Design of Steel Structures (3-1-0) 4	Transportation Engg. -I (3-1-2) 5	Technical Communication (3-0-0) 3	Dept. Elective -2 (3-1-0) 4	**6**	**18**	**4**	**4**	**26**	**24**
VI	Open Elective-2 (3-1-2) 5	Dept. Elective-3 (3-1-0) 4	Structural Analysis (3-1-2) 5	Dept. Elective-4 (3-1-0) 4	Business Law and Ethics (3-0-0) 3	Open Channel Flow (3-1-0) 4	**6**	**18**	**5**	**4**	**27**	**25**
Survey Camp (0-0-4) 2			Summer Industrial Training (0-0-4) 2				**2**	**0**	**0**	**8**	**8**	**4**
VII	Dept. Elective-5 (3-1-0) 4	Open elective-3 (3-1-0) 4	Advanced Structural Analysis (3-1-2) 5	Project-I (0-0-4) 2	Managerial Concepts and Practices (3-0-0) 3		**4**	**12**	**3**	**6**	**21**	**18**
VIII	Dept. Elective-6 (3-1-0) 4	Advanced RCC Structures (3-1-0) 4	Open Elective-4 (3-1-0) 4	Project-2 (0-0-16) 8	Dept. Elective-7 (3-1-0) 4		**4**	**12**	**4**	**16**	**32**	**24**

LIST OF DEPARTMENTAL ELECTIVES

1. Soil Mechanics
2. Geotechnical Engineering
3. Foundation Engineering
4. Design of High Rise Buildings
5. Construction Planning & Management
6. Construction & Building Science
7. Transportation Engg.-II
8. Railway Engineering
9. Pavement Design
10. Water Resource Engg
11. Irrigation Engineering
12. Fluvial Hydraulics
13. Design of Hydraulic Structures
14. Earthquake Engg.
15. Stress Analysis
16. Prestressed Concrete
17. Bridge Engineering

LIST OF OPEN ELECTIVES

1. Geomatics Engineering
2. Remote Sensing and GIS
3. Environmental Engineering-I
4. Public Health Engineering
5. Environmental Engineering-II
6. Environmental Management
7. Environmental Impact Assessment
8. Concepts of Green Building Design
9. Environmental Planning

Annexure-XXIII-C of Agenda Item no. 6.22

B.Tech.

in

Computer Science and Engineering

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Applicable to the students admitted from the academic year 2012

Department of Computer Science and Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Computer Science and Engineering
School:	School of Engineering and Technology
Name of the Course:	B.Tech. in Computer Science and Engineering
Duration:	Four years
Total number of Credits:	186
Date of Meeting of BOS:	June 22, 2012
Status:	Approved by BOS
Members of BOS:	1. Dr. Ravi Rastogi, HOD, Chairman 2. Prof. Om Vikas, Former director, IIITM (G) Ext. Member 3. Mr. Jitesh Khatri, LGE, Noida Ext. Member 4. Mr. T.P. Singh, Asstt. Professor Int. Member 5. Mr. Sudeep Varshney, Asstt. Profeesor Int. member 6. Ms. Bhairavee Singh, Asstt. Professor Int. member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by BOS and Faculty Board

COURSE STRUCTURE

B.Tech. in Computer Science and Engineering

SEMESTER	Courses (L-T-P)						Lecture Courses	Contact Hr/Week				Credits
								L	T	P	Total	
III	Discrete Structure (3-1-0) 4	Object Oriented Programming using C++ (3-1-2) 5	Management Concepts & practices (3-0-0) 3	Computer System Organization (3-0-2) 4	Microprocessor & ITS Applications (3-1-2) 5	Business Communication (3-0-0) 3	**6**	**18**	**3**	**6**	**27**	**24**
IV	Principles of Operating System (3-1-0)4	Computer Architecture (3-1-0)4	Java Programming (3-0-2) 4	Numerical & Statistical techniques (3-1-0)4	Data Structure using C (3-1-2)5	Technical Communication (3-0-0)3	**6**	**18**	**4**	**4**	**26**	**24**
V	Computer Networks (3-1-2)5	Software Engineering (3-1-2) 5	Principles of DBMS (3-1-2) 5	Department Elective-I (4-0-0) 4	Open Elective-I (4-0-0) 4	Managerial Economics (3-0-0) 3	**6**	**20**	**3**	**4**	**29**	**26**
VI	Design & Analysis of Algorithms (3-1-2) 5	Compiler Design (3-1-2)5	Artificial Intelligence (3-1-0)4	Department Elective-II (4-0-0) 4	Business Law & Ethics (3-0-0)3	Open Elective-II (4-0-0) 4	**6**	**20**	**3**	**4**	**27**	**25**
Summer Training (0-0-2)												**2**
VII	Soft Computing (3-1-0) 4	Web Technologies (3-1-2) 5	Department Elective-III (4-0-0) 4	Department Elective-IV (4-0-0)4	Open Elective-III (4-0-0)4	Project (0-0-4)2	**5**	**18**	**2**	**6**	**26**	**23**
VIII	Department Elective-V (3-0-0)3	Department Elective-VI (3-0-0) 3	Department Elective-VII (3-0-0) 3	Open Elective –IV (4-0-0) 4	Project (0-0-16) 8		**4**	**13**	**0**	**16**	**29**	**21**

Total Credits (including 1st Year Credits)- 186

Annexure-XXIII-C of Agenda Item no. 6.22

B.Tech.

in

Electronics and Communication Engineering
With specialization in
Instrumentation and Control

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2012-13)

Department of Electronics and Communication Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Electronics and Communication Engineering	
School:	School of Engineering and Technology	
Name of the Course:	B.Tech. in ECE with specialization in Instrumentation and Control	
Duration:	Four (04) years	
Total No. of Credits:	184	
Date of meeting of BOS:	July 12, 2012	
Status:	Approved by BOS	
Members of BOS:	1. Prof. R. M. Mehra, HOD, ECE	Chairman
	2. Prof. H. M. Gupta, IIT Delhi	External Member
	3. Prof. Avinashi Kapoor, University of Delhi	External Member
	4. Dr. Rajeev Srivastava, ST Microelectronics	External Member
	5. Dr. Amitava Majumdar, Moser Baer India	External Member
	6. Mr. Sandeep Singh, Coordinator, ECE	Internal member
	7. Ms Rashmi Priyadarshini, ECE	Internal member
	8. Ms Noor e Zahra, ECE	Internal member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

COURSE STRUCTURE

B.Tech in ECE with specialization in Instrumentation and Control 2nd year onwards

Sem.	Courses (L-T-P)						Courses	Contact Hours				Credits
								L	T	P	Total	
III	Analog Circuits (DC) (3-1-2) 5	Digital Electronics I (DC) (3-1-2) 5	Mathematics-3 (Engg Maths) (3-1-0) 4	Managerial Economics (3-0-0) 3	Signal and Systems (DC) (3-1-2) 5		5	15	4	6	25	22
IV	OE I (3-1-0) 4	Digital Electronics II (DC) (3-1-2) 5	Electronics and Electrical Measurements and Instrumentation (DC) (3-0-2)4	Business communication (3-0-0) 3	Microprocessors and interfacing s (DC) (3-0-2) 4	Concepts of OOPS programming using C++ (3-0-2) 4	6	18	2	8	28	24
V	Linear Integrated Circuit (DC) (3-1-2) 5	Communication Engg. (DC) (3-1-2) 5	DE I (3-1-2) 5	OE II (3-1-0) 4	DSP (DC) (3-1-2) 5	Technical Communication (3-0-0) 3	6	18	5	8	31	27
VI	Process Control (DC) (3-0-2) 4	Data Acquisition and Telemetry (DC) (3-1-2) 5	DEII (3-1-2) 5	Microcontrollers and applications (DC) (3-0-2) 4	OE III (3-1-0) 4	Managements Concept and Practices (3-0-0) 3	6	18	3	8	29	25
Summer Internship 2							0	0	0	0	0	02
VII	Analog CMOS VLSI Design (DC) (3-1-2) 5	DE III (3-1-2) 5	DE IV (3-1-0) 4	Photonic Devices (DC) (3-0-0) 3	Business Law & Ethics (3-0-0) 3	Project 2	5	15	3	4	22	22
VIII	DE V (3-1-2) 5	OE IV (3-1-0) 4	DE VI (3-1-0) 4	Project 8			3	09	3	2	14	21
	TOTAL						**12+31 = 43**	**27+93 =120**	**5+20 = 25**	**18+36 = 54**	**50+149 = 199**	**41+143 = 184**

Total Credits- 41+143 =184

Legends:

Basic Sciences **(BS)**	: 27
Engineering Art and Sciences (**EAS)**	: 19
Humanities (**HMM)**	: 18
Departmental Core (**DC)**	: 64
Departmental Elective (**DE)**	: 28
Open Elective (**OE)**	: 16
Summer Internship	: 02
Project	: 10
TOTAL	**184**

List of Courses

LIST OF DEPARTMENTAL CORE

1. Analog Circuits
2. Digital Electronics I
3. Digital Electronics II
4. Signal and Systems
5. Electronics and Electrical Measurements and Instrumentation
6. Linear Integrated Circuits
7. Communication Engineering
8. Process Control
9. Data Acquisition and Telemetry
10. Digital Signal Processing
11. Microprocessors and Interfacings
12. Microcontrollers and applications
13. Analog CMOS VLSI Design
14. Photonic Devices

LIST OF DEPARTMENTAL ELECTIVES

1. Control System
2. Digital Logic Design
3. Information Theory and Coding
4. Smart Sensors and Intelligent Controllers
5. Energy Generation and Conversion

6. Image Processing
7. Biomedical Instrumentation
8. Advance DSP
9. Speech Processing
10. Automobile Instrumentation
11. Digital CMOS VLSI Design
12. Embedded Systems
13. Instrumentation and Control for Steel Industry
14. Computer Networks
15. Nano Instrumentation
16. Optoelectronic Instrumentation
17. Memories and applications
18. Design Flow

LIST OF OPEN ELECTIVES

1. Analog and Digital Communication
2. Embedded Systems And Design
3. Wireless Sensor Networks
4. Semiconductor Materials and Applications

Annexure-XXIII-C of Agenda Item no. 6.22

B.Tech.

in

Electronics and Communication Engineering

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2012-13)

Department of Electronics and Communication Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Electronics and Communication Engineering	
School:	School of Engineering and Technology	
Name of the Course:	B.Tech. in ECE	
Duration:	Four (04) years	
Total No. of Credits:	184	
Date of meeting of BOS:	July 12, 2012	
Status:	Approved by BOS	
Members of BOS:	1. Prof. R. M. Mehra, HOD, ECE	Chairman
	2. Prof. H. M. Gupta, IIT Delhi	External Member
	3. Prof. Avinashi Kapoor, University of Delhi	External Member
	4. Dr. Rajeev Srivastava, ST Microelectronics	External Member
	5. Dr. Amitava Majumdar, Moser Baer India	External Member
	6. Mr. Sandeep Singh, Coordinator, ECE	Internal member
	7. Ms Rashmi Priyadarshini, ECE	Internal member
	8. Ms Noor e Zahra, ECE	Internal member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

COURSE STRUCTURE

B.Tech in Electronics and Communication Engineering 2nd year onwards

Sem.	Courses (L-T-P)						Courses	Contact Hours				Credits
								L	T	P	Total	
III	Analog Circuits (DC) (3-1-2) 5	Digital Electronics I (DC) (3-1-2) 5	Mathematics-3 (Engg Maths) (3-1-0) 4	Managerial Economics (3-0-0) 3	Signal and Systems (DC) (3-1-2) 5		5	15	4	6	25	22
IV	OE I (3-1-0) 4	Digital Electronics II (DC) (3-1-2) 5	EMFT (DC) (3-1-0) 4	Business communication (3-0-0) 3	Microprocessors and interfacing s (DC) (3-0-2) 4	Concepts of OOPS programming using C++ (3-0-2) 4	6	18	3	6	27	24
V	Linear Integrated Circuit (DC) (3-1-2) 5	Communication Engg. (DC) (3-1-2) 5	DE I (3-1-2) 5	OE II (3-1-0) 4	DSP (DC) (3-1-2) 5	Technical Communication (3-0-0) 3	6	18	5	8	31	27
VI	Antenna and Radar Engg. (DC) (3-1-0) 4	Digital Communication (DC) (3-1-2) 5	DEII (3-1-2) 5	Microcontrollers and applications (DC) (3-0-2) 4	OE III (3-1-0) 4	Managements Concept and Practices (3-0-0) 3	6	18	4	6	28	25
Summer Internship 2							0	0	0	0	0	02
VII	Analog CMOS VLSI Design (DC) (3-1-2) 5	DE III (3-1-2) 5	DE IV (3-1-0) 4	Photonic Devices (DC) (3-0-0) 3	Business Law & Ethics (3-0-0) 3	Project 2	5	15	3	4	22	22
VIII	DE V (3-1-2) 5	OE IV (3-1-0) 4	DE VI (3-1-0) 4	Project 8			3	09	3	2	14	21
	TOTAL						**12+31 = 43**	**27+93 =120**	**3+22 = 25**	**18+32 =50**	**51+147 = 198**	**41+143 = 184**

Total Credits- 41+143 =184

Legends:

Basic Sciences **(BS)**	: 27
Engineering Art and Sciences (**EAS)**	: 19
Humanities (**HMM)**	: 18
Departmental Core (**DC)**	: 64
Departmental Elective (**DE)**	: 28
Open Elective (**OE)**	: 16
Summer Internship	: 02
Project	: 10
TOTAL	**184**

List of Courses

List of Departmental Core

1. Analog Circuits
2. Digital Electronics I
3. Digital Electronics II
4. Signal and Systems
5. EMFT (Electromagnetic Field Theory)
6. Linear Integrated Circuits
7. Communication Engineering
8. Antenna and Radar Engineering
9. Digital Communication
10. Digital Signal Processing
11. Microprocessors and Interfacings
12. Microcontrollers and applications
13. Analog CMOS VLSI Design
14. Photonic Devices

List of Departmental Elective

1. Control System
2. Digital Logic Design
3. Information Theory and Coding
4. Microwave Engineering
5. Energy Generation and Conversion
6. Image Processing

7. Wireless and Mobile Communication
8. Advance DSP
9. Speech Processing
10. Optical Communication
11. Digital CMOS VLSI Design
12. Embedded Systems
13. Satellite Communication
14. Data Communication Network
15. Telecom Switching
16. Detection and Estimation
17. Memories and applications
18. Design Flow

List of Open Elective

1. Analog and Digital Communication
2. Embedded Systems and Design
3. Wireless Sensor Networks
4. Semiconductor Materials and Applications

Annexure-XXIII-C of Agenda Item no. 6.22

B.Tech.

in

ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2012-13)

Department of Electrical and Electronics Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

B. Tech. EEE

Sem.	COURSE STRUCTURE						Courses	L	T	P	Weekly Contact	Credits
III	Electrical Machines-1(DC) (3- 1 - 2) 5	EMFT (DC) (3-1-0) 4	Electronic Devices and Circuits (DC) (3 -1 - 2) 5	Maths-3 (3-1-0) 4	Managerial Economics(HM) (3-0-0)3	Network Analysis & Synthesis(DC) (3–1–2) 5	6	18	5	6	29	26
IV	Electrical Machines-2 (DC) (3 - 1 - 2) 5	Electrical and Electronic Measurement(DC) (3 - 1- 2) 5	Power System-1(DC) (3 - 1 - 2)5	Business Communication (HM) (3- 0 - 0) 3	Concepts of oops programming using C++ (3-0-2) 4		5	15	3	8	26	22
V	Linear Control System (DC) (3- 1 - 2) 5	Power System-2 (DC) (3 - 1 - 2)5	Power Electronics (DC) (3 - 1 - 2) 5	OE 1 (3 -1 - 0) 4	DE -1 (3-1-0)4	Technical Communication (HM) (3- 0- 0) 3	6	18	5	6	29	26
VI	Managements Concepts and Practices(HM) (3-0-0)3	Modern Control Systems (DC) (3-1-0)4	DE-2 (3 - 1- 0) 4	DE-3 (3- 1- 0) 4	OE 2 (3 – 1 – 0) 4	Switchgear and Protection (DC) (3- 1- 2) 5	6	18	5	2	25	24
Summer Training (0-0-4) 2												2
VII	Project-1 (0-0-4)2	High Voltage Engineering (DC) (3-1-0)4	OE 3 (3-1-0)4	DE-4 (3 -1 - 0)4	Business Law and Ethics (HM) (3- 0 - 0) 3	DE-5 (3 - 1- 0) 4	6	15	4	4	23	21
VIII	Project-2 (0-0-16)8	OE 4 (3-1-0)4	DE-6 (3 - 1- 0) 4	DE-7 (3- 1- 0) 4			4	9	3	16	28	20
	Total (Including 41 Credits of 1st year)											**182**

Legends:

BS: Basic Sciences
DC: Departmental Core
DE: Departmental Electives
OE: Open Electives
HM: Humanities

Departmental Core

1. Electrical Machines I
2. Electronic Devices and Circuits
3. Electrical Machines II
4. Electromagnetic Field Theory
5. Network Analysis and Synthesis
6. Electrical and Electronic Measurements
7. Linear Control Systems
8. Power Systems I
9. Power Systems II
10. Switchgear and Protection
11. Power Electronics
12. Modern Control Systems
13. High Voltage Engineering

Departmental Electives

Electives 1

1. Electrical Machine Design
2. Power Plant Engineering
3. Power Quality

Electives 2

1. Advanced Power electronics and Drives
2. Flexible AC Transmission systems
3. Power System Reliability

Electives 3

1. Energy Management
2. Operation and Control of Power Systems
3. Analog and Digital Communication

Electives 4

1. Optical Fiber Communication
2. Antenna and Wave Propagation
3. Satellite Communication

Electives 5

1. Advanced Engineering Material
2. Simulation and modeling
3. Power Systems Dynamics

Electives 6

1. High Voltage DC Transmission
2. Control of Machines and Programmable Logic Controller
3. Bio-medical Electronics
4. Power System Deregulation

Electives 7

1. Introduction to fuzzy logic and Neural Networks
2. Computer Based Instrumentation Systems
3. Electrical Energy Utilization and Traction
4. Telemetry and SCADA

Open Electives

1. Control Systems
2. Industrial Instrumentation

Annexure-XXIII-C of Agenda Item no. 6.22

B. Tech.
in
Information Technology

COURSE STRUCTURE & SYLLABI
(with effect from academic session 2012-13)

Department of Information Technology
School of Engineering and Technology

SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Information Technology
School:	School of Engineering and Technology
Name of the Course:	B.Tech. in Information Technology
Duration:	Four years
Total No. of Credits:	184
Date of Meeting of BOS:	July 11, 2012
Members of BOS:	1. Prof. A.K.Soni, HOD — Chairman 2. Dr. P.S Grover, Ex-Professor, Delhi University — Ext. Member 3. Dr. Viveka Kumar, Mathematics — Int. Member 4. Mr. Ashok Sahoo, CSE — Int. Member 5. Mr. Surendra Singh Chahar, IT — Int. Member 6. Mr. Sandeep Singh, ECE — Int. Member 7. Mr. Amit Kumar Upadhyay, IT — Int. Member
Date of Meeting of Faculty Board:	July 18,2012
Status :	Approved by BOS and Faculty Board

COURSE STRUCTURE

Information Technology

SEMESTER	Courses (L-T-P) Credits						L. Courses	Contact Hr./ Week				Credits
								L	T	P	Total	
III	Computer Organization (3-1-0) 4	Data Structure (3-1-2) 5	Concepts of Object Oriented Programming (3-1-2) 5 (Common to all branches)	Digital Electronics (3-1-2) 5	Mathematics-III (3-1-0) 4	Managerial Economics (3-0-0) 3	6	18	5	6	29	26
IV	Discrete Structures (3-1-0) 4	Microprocessor and Applications (3-1-2) 5	Database Management Systems (3-1-2) 5	Operating System (3-1-2) 5	Business Communication (3-0-0) 3		5	15	4	6	25	22
V	Design and Analysis of Algorithms (3-1-2) 5	Introduction to Computer Networks (3-1-2) 5	OPEN ELECTIVE-1 (3-1-0) 4	Enterprise Resource Planning (3-1-0) 4	Technical Communication (3-0-0) 3		5	15	4	4	23	21
VI	Computer Graphics (3-0-2) 4	Software Engineering (3-1-0) 4	DEPARTMENTAL ELECTIVE-1 (3-1-0) 4	DEPARTMENTAL ELECTIVE-2 (3-1-2) 5	OPEN ELECTIVE-2 (3-1-0) 4	Management Concepts & Practices (3-0-0) 3	6	18	4	4	26	24
Summer	Industrial Training (0-0-4) 2						1	0	0	4	4	2
VII	Network Programming (3-1-2) 5	Project (0-0-4) 2	DEPARTMENTAL ELECTIVE-3 (3-1-0) 4	DEPARTMENTAL ELECTIVE-4 (3-1-2) 5	OPEN ELECTIVE-3 (3-1-0) 4	Business Law & Ethics (3-0-0) 3	6	15	4	8	27	23
VIII	Project (0-0-16) 8	OE-4 (3-1-0) 4	Data & Network Security (3-1-0) 4 [1801 / CMP006]	DEPARTMENTAL ELECTIVE-5 (3-1-0) 4	DEPARTMENTAL ELECTIVE-6 (3-1-0) 4		5	12	4	16	32	24
Total (Including 1st Year Credits)							**46**	**120**	**31**	**66**	**217**	**184**

Total Credits - 184

LIST OF DEPARTMENTAL ELECTIVES

1. Theory of Automata & Computing
2. Soft Computing
3. Distributed Operating System
4. Multimedia and Animation
5. Internet & Web Technology
6. Software Project Management
7. E – Commerce
8. Mobile Operating Systems
9. Introduction to Computer Architecture
10. Artificial Intelligence
11. Software Development with .NET Framework
12. Digital Signal Processing
13. Mobile Computing
14. Software Testing
15. Digital Image Processing
16. Data Warehousing & Data Mining
17. Cloud Computing
18. Advanced Computer Networks

LIST OF OPEN ELECTIVES

1. Soft Computing
2. E-Commerce
3. Enterprise Resource Planning
4. Cloud Computing

Annexure-XXIII-C of Agenda Item no. 6.22

B. Tech.
in
Mechanical Engineering

(With Special Focus to
Automobile Engineering through Electives)

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Mechanical and Automobile Engineering

School of Engineering and Technology

SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Mechanical and Automobile Engineering
School:	School of Engineering and Technology
Name of the Course:	B.Tech. in Mechanical Engineering (with special focus to Automobile Engineering through Electives)
Duration:	Four (04) years
Total Number of Credits:	184
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. G. P. Sinha, HOD, ME&AE, Chairman 2. Prof. D.V. Singh, Fmr. Dir., IIT-R, Ext. Member 3. Prof. S. Prasad, Advisor, GLA Bajaj, Special Invitee 4. Prof. P.K. Sinha, Prof. Emer., ME&AE, Int. Member 5. Prof. R.C. Sachdeva, Dist. ME&AE, Int. Member 6. Prof. Y.V. Satya Kumar, ME&AE, Int. Member 7. Prof. Subhash Kamal, ME&AE, Int. Member 8. Dr. A. Singh, Assoc. Prof., ME&AE, Int. Member 9. Mr. Manish Kr. Yadav, Asst. Prof., Int. Member 10. Mr. Umesh Kr. Jha, Asst. Prof, Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by the BOS and Faculty Board

B. Tech.
Mechanical Engineering
(with special focus to Automobile Engineering)
Second Year

Sem	COURSES						Course	L	T	P	Weekly Contact Hrs.	Credits
III	OOPS Programming using C^{++} (3-1-2) 5	Engineering Mechanics (3-1-2) 5	Managerial Economics (3-0-0) 3	Strength of Materials (3-1-2) 5	Applied Thermodynamics (3-1-2) 5		5	15	4	8	27	**23**
IV	Metrology (3-0-2) 4	Fluid Mechanics (3-1-2) 5	Kinematics of Machines (3-1-2) 5	Materials Science and Engineering (3-0-2) 4	Business Communication (3-0-0) 3	Mathematics-III (3-1-0) 4	6	18	3	8	29	**25**

B. Tech.
Mechanical Engineering
(with special focus to Automobile Engineering)
Third Year

Sem	COURSES						Course	L	T	P	Weekly Contact	Credits
V	Heat Transfer (3-1-2) 5	Dynamics of Machine (3-1-2) 5	Machine Design (3-1-0) 4	Department Elective – I (4-0-0) 4	Open Elective-I (4-0-0) 4	Technical Communication (3-0-0) 3	6	20	3	4	27	**25**
VI	I.C. Engines (3-1-2) 5	Hydraulic Machines (3-1-2) 5	Department Elective – II (4-0-0) 4	Department Elective–III (4-0-0) 4	Business Law & Ethics (3-0-0)3	Open Elective II (4-0-0) 4	6	21	2	4	27	**25**
	Summer Training						-	-	-	-	-	**02**

B. Tech.
Mechanical Engineering
(with special focus to Automobile Engineering)
Fourth Year

Sem	COURSES						Course	L	T	P	Weekly Contact	Credits
VII	Department Elective–V (4-0-0) 4	Refrigeration & Air Conditioning (3-1-2) 5	Department Elective – IV (4-0-0) 4	Management Concept & Practices (3-0-0) 3	Open Elective III (4-0-0) 4	Project (0-0-4) 2	6	16	2	6	24	**22**
VIII	Department Elective –VI (4-0-0) 4	Department Elective –VII (4-0-0) 4	Open Elective IV (4-0-0) 4	Project (0-0-16) 8			4	12	0	16	28	**20**
Total Credits (Including 1st year credits)												**184**

COURSE STRUCTURE

B.Tech. in Mechanical Engineering (with special focus to Automobile Engineering through Electives)

(from the Academic Year 2012-13)

SEMESTER	Courses (L-T-P)						Courses	Contact Hr/Week				Credits
								L	T	P	Total	
III	OOPS Programming using C++ (3-1-2) 5	Engineering Mechanics (3-1-2) 5	Managerial Economics (3-0-0) 3	Strength of Materials (3-1-2) 5	Applied Thermodynamics (3-1-2) 5		5	15	4	8	27	**23**
IV	Metrology (3-0-2) 4	Fluid Mechanics (3-1-2) 5	Kinematics of Machines (3-1-2) 5	Material Science (3-0-2) 4	Business Communication (3-0-0) 3	Mathematics- III (3-1-0) 4	6	18	3	8	29	**25**
V	Heat Transfer (3-1-2) 5	Dynamics of Machine (3-1-2) 5	Machine Design (3-1-0) 4	Open Elective-I (4-0-0) 4	Department Elective – I (4-0-0) 4	Technical Communication (3-0-0) 3	6	20	3	4	27	**25**
VI	I.C. Engines (3-1-2) 5	Hydraulic Machines (3-1-2) 5	Department Elective – II (4-0-0) 4	Department Elective–III (4-0-0) 4	Business law & ethics (3-0-0)3	Open Elective II (4-0-0) 4	6	21	2	4	27	**25**
	Summer Training (after VI term)											**02**
VII	Department Elective–V (4-0-0) 4	Refrigeration & Air Conditioning (3-1-2) 5	Department Elective – IV (4-0-0) 4	Open Elective III (4-0-0) 4	Management Concept & Practices (3-0-0) 3	Project (0-0-4) 2	6	16	2	6	24	**22**
VIII	Department Elective –VI (4-0-0) 4		Department Elective –VII (4-0-0) 4		Open Elective IV (4-0-0) 4	Project (0-0-16) 8	4	12	0	16	28	**20**

Total Credits (Including 1st year credits): 184

OVERALL CREDIT DISTRIBUTION

B.Tech. in Mechanical Engineering
(with special focus to Automobile Engineering through Electives)
(from the Academic Year 2012-13)

S. No.	Distribution	Year				Total Credits
		I	II	III	IV	
1	Basic Sciences (Phy., Chem., Math. Env.) (**BS**) Core	24	04	-	-	**28**
2	Engineering Arts and Science (**EAS**) Core	15	05	-	-	**20**
3	Humanities, Social Sciences and Basic Professional Skills (**HM**) Core	03	06	06	03	**18**
4	Main Discipline: i) Department Core (**DC**) ii) Department Elective (**DE**)	- -	33 -	24 12	05 16	**62** **28**
5	Open Elective (**OE**)	-	-	08	08	**16**
6	Summer Training after VI Semester	-	-	-	02	**02**
7	Project In VII & VIII Semesters for Credits of 02 & 06	-	-	-	010	**010**
	TOTAL	**42**	**48**	**50**	**44**	**184**

List of Department Electives

NOTE: Suitable Electives will be offered by the Dept from this Entire List and can be opted by the Students with the Automobile Focus

1. Pressure Vessel Design
2. Industrial Tribology
3. Industrial Design & Ergonomics
4. Industrial Product Design
5. Optimization Methods in Engineering Design
6. Industrial Engineering and Management
7. Risk Management
8. Production Management
9. Disaster Management
10. Safety Management
11. Operations Research
12. Total Quality Management
13. Reliability Engineering
14. Materials Management
15. Entrepreneurship Development
16. Advanced Manufacturing Processes
17. Non Conventional Machining Processes
18. Non -Destructive Testing
19. Sheet Metal Technology
20. Flexible Manufacturing System
21. Noise & Vibration Analysis And Control
22. Simulation of I.C. Engine Processes
23. Statistical Quality Control
24. Advanced Numerical Methods
25. Machine Design
26. Introduction to Robotics Engineering
27. Robotics And Manipulators
28. Experimental Stress-Analysis
29. Reliability Based Design
30. Automotive Transmission
31. Finite Element Methods
32. Computational Fluid Dynamics
33. Statistical Process Control
34. Power Plant Engineering
35. Nuclear Power
36. Energy Management
37. Non-Conventional Energy

38. Advanced Manufacturing Processes
39. Modern Vehicle Technology
40. Computer Integrated Manufacturing
41. Advances in Material Processing
42. Tribology and Terotechnology
43. Robotics and Robot Applications
44. Tractors and Farm Equipment
45. Industrial Engineering
46. Alternate Fuels and Energy Systems
47. Microprocessor Application in Automobiles
48. Transport Management and Automobile Industry
49. Off-Road Vehicles
50. Management Information System
51. Entrepreneurship and E-Business
52. Quality Control and Reliability
53. Automotive Transmission
54. Automotive Safety
55. Computer Aided Vehicle Design
56. Two and Three Wheelers
57. Automotive Vehicle Maintenance
58. Automotive Electrical & Electronics
59. Mechanical Vibrations
60. Automotive Pollution and Control
61. Principles of Environmental Science and Engineering
62. Vehicle Dynamics
63. Automotive Chassis Design
64. Advanced Materials and Nanomaterials
65. Nonlinear Vibration Control
66. Compressors, Pumps and Prime Movers
67. Advanced Gas Dynamics
68. Thermal Power
69. Hydel Power
70. Advanced Refrigeration Systems
71. Advanced Study of I.C. Engines
72. Maintenance Management
73. Transport Management
74. CPM &PERT
75. Aerodynamics
76. Meteorological Analysis
77. Advanced Composite Materials
78. Electrical Materials and Magnetic Materials
79. Powder Processing and Laser Processing
80. Computerized Numerical Control of Machine Tools

81. Tool Life-Cycle Management
82. Vehicle Performance Analysis
83. Geometrical Constructions
84. Tensor Analysis
85. Combustion and Heat Transfer
86. Hydraulic and Pneumatic Machines
87. Automotive Air-conditioning

List of Open Electives

1	Basics of Mechanical Engineering
2	Basics of Automotive Engineering
3	Measurements and Instrumentation
4	Instrumentation and Control
5	Non- Destructive Testing
6	Advanced Materials and Nano Materials
7	Advanced Composite Materials
8	Electrical Materials & Magnetic Materials
9	Quality Engineering
10	Operations Research
11	Applied Numerical Methods
12	CFD
13	CPM & PERT
14	Compressors, Pumps & Prime Movers
15	Cutting Tools
16	Aerodynamics
17	Pressure Vessel Design
18	Theory of Plates and Shells
19	Farm Equipments
20	Hybrid Propulsion
21	Advanced Manufacturing Technology
22	Introduction to Robotics
23	Non Conventional Energy Resources
24	Fleet Management
25	Water Supply Management
26	Entrepreneurship Development
27	Statistical Quality Control
28	Human Ergonomics
29	Industrial Engineering
30	Power Plant Engineering

Annexure-XXIII-C of Agenda Item no. 6.22

B. Tech.
in
Mechanical Engineering

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Mechanical and Automobile Engineering

School of Engineering and Technology

SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Mechanical and Automobile Engineering
School:	School of Engineering and Technology
Name of the Course:	B.Tech. in Mechanical Engineering
Duration:	Four (04) years
Total Number of Credits:	184
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. G. P. Sinha, HOD, ME&AE, Chairman 2. Prof. D.V. Singh, Fmr. Dir., IIT-R, Ext. Member 3. Prof. S. Prasad, Advisor, GLA Bajaj, Special Invitee 4. Prof. P.K. Sinha, Prof. Emer., ME&AE, Int. Member 5. Prof. R.C. Sachdeva, Dist. ME&AE, Int. Member 6. Prof. Y.V. Satya Kumar, ME&AE, Int. Member 7. Prof. Subhash Kamal, ME&AE, Int. Member 8. Dr. A. Singh, Assoc. Prof., ME&AE, Int. Member 9. Mr. Manish Kr. Yadav, Asst. Prof., Int. Member 10. Mr. Umesh Kr. Jha, Asst. Prof, Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by the BOS and Faculty Board

B. Tech.
Mechanical Engineering
Second Year

Sem	COURSES						Course	L	T	P	Weekly Contact Hrs.	Credits
III	OOPS Programming using C^{++} (3-1-2) 5	Engineering Mechanics (3-1-2) 5	Managerial Economics (3-0-0) 3	Strength of Materials (3-1-2) 5	Applied Thermodynamics (3-1-2) 5		5	15	4	8	27	**23**
IV	Metrology (3-0-2) 4	Fluid Mechanics (3-1-2) 5	Kinematics of Machines (3-1-2) 5	Materials Science and Engineering (3-0-2) 4	Business Communication (3-0-0) 3	Mathematics-III (3-1-0) 4	6	18	3	8	29	**25**

B. Tech.
Mechanical Engineering
Third Year

Sem	COURSES						Course	L	T	P	Weekly Contact	Credits
V	Heat Transfer (3-1-2) 5	Dynamics of Machine (3-1-2) 5	Machine Design (3-1-0) 4	Department Elective – I (4-0-0) 4	Open Elective-I (4-0-0) 4	Technical Communication (3-0-0) 3	6	20	3	4	27	**25**
VI	I.C. Engines (3-1-2) 5	Hydraulic Machines (3-1-2) 5	Department Elective – II (4-0-0) 4	Department Elective–III (4-0-0) 4	Business Law & Ethics (3-0-0)3	Open Elective II (4-0-0) 4	6	21	2	4	27	**25**
	Summer Training						-	-	-	-	-	**02**

B. Tech.
Mechanical Engineering
Fourth Year

Sem	COURSES						Course	L	T	P	Weekly Contact	Credits
VII	Department Elective–V (4-0-0) 4	Refrigeration & Air Conditioning (3-1-2) 5	Department Elective – IV (4-0-0) 4	Management Concept & Practices (3-0-0) 3	Open Elective III (4-0-0) 4	Project (0-0-4) 2	6	16	2	6	24	**22**
VIII	Department Elective –VI (4-0-0) 4	Department Elective –VII (4-0-0) 4	Open Elective IV (4-0-0) 4	Project (0-0-16) 8			4	12	0	16	28	**20**
Total Credits (Including 1st Year Credits)												**184**

COURSE STRUCTURE

B.Tech. in Mechanical Engineering (from the Academic Year 2012-13)

SEMESTER	Courses (L-T-P)						Courses	Contact Hr/Week				Credits
								L	T	P	Total	
III	OOPS Programming using C ++ (3-1-2) 5	Engineering Mechanics (3-1-2) 5	Managerial Economics (3-0-0) 3	Strength of Materials (3-1-2) 5	Applied Thermodynamics (3-1-2) 5		5	15	4	8	27	**23**
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	Summer Training (after VI term)											**02**
VII	Department Elective–V (4-0-0) 4	Refrigeration & Air Conditioning (3-1-2) 5	Department Elective – IV (4-0-0) 4	Open Elective III (4-0-0) 4	Management Concept & Practices (3-0-0) 3	Project (0-0-4) 2	6	16	2	6	24	**22**
VIII	Department Elective –VI (4-0-0) 4	Department Elective –VII (4-0-0) 4	Open Elective IV (4-0-0) 4	Project (0-0-16) 8			4	12	0	16	28	**20**

Total Credits (Including 1st Year Credits): 184

OVERALL CREDIT DISTRIBUTION

B.Tech. in Mechanical Engineering (from the Academic Year 2012-13)

S. No.	Distribution	Year				Total Credits
		I	II	III	IV	
1	Basic Sciences (Phy., Chem., Math. Env.) (**BS**) Core	24	04	-	-	**28**
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3	Humanities, Social Sciences and Basic Professional Skills (**HM**) Core	03	06	06	03	**18**
4	Main Discipline: i) Department Core (**DC**) ii) Department Elective (**DE**)	- -	33 -	24 12	05 16	**62** **28**
5	Open Elective (**OE**)	-	-	08	08	**16**
6	Summer Training after VI Semester	-	-	-	02	**02**
7	Project In VII & VIII Semesters for Credits of 02 & 06	-	-	-	010	**010**
	TOTAL	**42**	**48**	**50**	**44**	**184**

List of Department Electives

1. Pressure Vessel Design
2. Industrial Tribology
3. Industrial Design & Ergonomics
4. Industrial Product Design
5. Optimization Methods in Engineering Design
6. Industrial Engineering and Management
7. Risk Management
8. Production Management
9. Disaster Management
10. Safety Management
11. Operations Research
12. Total Quality Management
13. Reliability Engineering
14. Materials Management
15. Entrepreneurship Development
16. Advanced Manufacturing Processes
17. Non Conventional Machining Processes
18. Non -Destructive Testing
19. Sheet Metal Technology
20. Flexible Manufacturing System
21. Noise & Vibration Analysis And Control
22. Simulation of I.C. Engine Processes
23. Statistical Quality Control
24. Advanced Numerical Methods
25. Machine Design
26. Introduction to Robotics Engineering
27. Robotics And Manipulators
28. Experimental Stress-Analysis
29. Reliability Based Design
30. Automotive Transmission
31. Finite Element Methods
32. Computational Fluid Dynamics
33. Statistical Process Control
34. Power Plant Engineering
35. Nuclear Power
36. Energy Management
37. Non-Conventional Energy
38. Advanced Manufacturing Processes
39. Modern Vehicle Technology
40. Computer Integrated Manufacturing
41. Advances in Material Processing
42. Tribology and Terotechnology
43. Robotics and Robot Applications
44. Tractors and Farm Equipment
45. Industrial Engineering
46. Alternate Fuels and Energy Systems
47. Microprocessor Application in Automobiles
48. Transport Management and Automobile Industry
49. Off-Road Vehicles
50. Management Information System
51. Entrepreneurship and E-Business

52. Quality Control and Reliability
53. Automotive Transmission
54. Automotive Safety
55. Computer Aided Vehicle Design
56. Two and Three Wheelers
57. Automotive Vehicle Maintenance
58. Automotive Electrical & Electronics
59. Mechanical Vibrations
60. Automotive Pollution and Control
61. Principles of Environmental Science and Engineering
62. Vehicle Dynamics
63. Automotive Chassis Design
64. Advanced Materials and Nanomaterials
65. Nonlinear Vibration Control
66. Compressors, Pumps and Prime Movers
67. Advanced Gas Dynamics
68. Thermal Power
69. Hydel Power
70. Advanced Refrigeration Systems
71. Advanced Study of I.C. Engines
72. Maintenance Management
73. Transport Management
74. CPM &PERT
75. Aerodynamics
76. Meteorological Analysis
77. Advanced Composite Materials
78. Electrical Materials and Magnetic Materials
79. Powder Processing and Laser Processing
80. Computerized Numerical Control of Machine Tools
81. Tool Life-Cycle Management
82. Vehicle Performance Analysis
83. Geometrical Constructions
84. Tensor Analysis

List of Open Electives

1 Basics of Mechanical Engineering
2 Basics of Automotive Engineering
3 Measurements and Instrumentation
4 Instrumentation and Control
5 Non- Destructive Testing
6 Advanced Materials and Nano Materials
7 Advanced Composite Materials
8 Electrical Materials & Magnetic Materials
9 Quality Engineering
10 Operations Research
11 Applied Numerical Methods
12 CFD
13 CPM & PERTt
14 Compressors, Pumps & Prime Movers
15 Cutting Tools
16 Aerodynamics
17 Pressure Vessel Design
18 Theory of Plates and Shells
19 Farm Equipments
20 Hybrid Propulsion
21 Advanced Manufacturing Technology
22 Introduction to Robotics
23 Non Conventional Energy Resources
24 Fleet Management
25 Water Supply Management
26 Entrepreneurship Development
27 Statistical Quality Control
28 Human Ergonomics
29 Industrial Engineering
30 Power Plant Engineering

Annexure-XXIII-C of Agenda Item no. 6.22

B.Tech.

COURSE STRUCTURE & SYLLABI
for
Professional Communication (PCM)

*****Syllabus of First year (2012) Onwards
*Syllabus of Ongoing Session

(with effect from academic session 2012-13)

Department of Humanities
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Humanities
School:	School of Engineering and Technology
Name of the Course:	B. Tech
Duration:	Four years
Total number of Credits:	
Date of Meeting of BOS:	June 15, 2012
Members of BOS:	1. Prof. Rakesh Kumar, HOD — Chairman 2. Prof. Om Prakash, Gautam Buddha Univ. — Ext. Member 3. Dr. H. K. Jha — Intr. Member 4. Dr. Kumar Gautam Anand — Intr. Member 5. Dr. Gurpyari Bhatnagar — Intr. Member 6. Dr. Naheed Saba — Intr. Member 7. Ms. Sakshi Jain — Intr. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by BOS on 15 June 2012 and Faculty Board on July 18 2012

LIST OF DEPARTMENTAL ELECTIVES

NIL

LIST OF OPEN ELECTIVES

Nil

B.Tech.

in

(All Departments)

Professional Communication (PCM)

SYLLABI

2012 ONWARDS SYLLABUS

Semester I/II

PCM 110: English Language

LTP: 2-0-1 **Credit : 03**

UNIT 1: Basics of Grammar (05)

- Parts of Speech: Noun, Pronoun, Verb , Adverb, Adjective, Conjunction, Preposition, Interjection
- Types of Articles: Definite and Indefinite
- Tenses
- Types of Sentences: Simple, Complex and Compound.

UNIT 2: Vocabulary Building (05)

- Word Formation Processes: Inflection, Derivation, Affixation
- Synonyms and antonyms
- Homonyms and homophones
- One-word substitutes, idioms and phrases

UNIT 3: Writing Skills (05)

- Paragraph writing
- Précis writing and Summary writing
- Essay writing: Structure and Construction

UNIT 4: Fundamentals of Communication (04)

- What is communication? Communication process and attributes of effective communication
- Role and purpose of communication
- What is verbal and non-verbal communication?
- Elements of non-verbal communication: Kinesics, Proxemics, Paralinguistics

UNIT 5: Barriers to Effective Communication (03)

- What are barriers to communication. Interpersonal/Intrapersonal/Organizational Barriers. An outline of such barriers.
- Socio-Psychological Barriers
- Language and Semantic Barriers:
  Removing redundancies, Getting rid of ambiguity, Euphemism, Jargon.

References:

- Murphy. *Murphy's English Grammar* with CD, Cambridge University Press.
- Dixson, Robert J. *Everyday Dialogues in English,* Prentice-Hall of India Ltd., 2006.
- Murlikrishna, C and Sunita Mishra, *Communication Skills for Engineers.* Dorling Kindersley Pvt. Ltd. 2011
- Blum, M. Rosen. *How to Build Better Vocabulary*. London: Bloomsbury Publication
- Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge: CUP fsdsds
- Duck, Steve and Mcmahan. *The Basics Of Communication: A Relational Perspective.* Sage Publication. 2012
- Singh, R.P and Pandey. *Manual of Practical Communication.* Delhi: A.I.T.B.S Publications India Ltd.
- Treece, Malra. *Successful Communication for Business and the Professions.*Allyn& Bacon. 1994

Semester III/IV

PCM 208: Business Communication

LTP: 2-0-1 **Credits: 03**

UNIT 1: Business Communication **05**

- Business correspondence: Differences between business correspondence and technical correspondence
- Nature and Scope of Technical Communication: Accuracy, Brevity, Clarity, Objectivity, Intelligibility, Relevance in communication.
- Language in a formal Domain

UNIT 2: Planning and Organizing the Presentation **04**

- Presentation: Nature and Importance of Presentations
- Individual and Team Presentations (Use of Team Presentations, Benefits of Team Presentations)
- Analyzing the Audience, Situation and Developing the Central Idea
- Collating Support Material (Audio and Visual Aids)
- Organizing the Presentation- Introduction, Body and Conclusion

UNIT 3: Letters **05**

- Structure and Lay out of a Letter- Introduction of self, company, product & services, central idea
- Request, Reminders and persuasion
- Writing about the routine, pleasant and unpleasant
- 02 Workshops

UNIT 4: Organizational Correspondence: **04**

- Minutes, Memo, Office Order
- Notices, Agenda.
- Placing Orders, Enquiry Letters

UNIT 5: Etiquettes and Mannerism **04**

- Self-introduction, introducing others, interaction in formal Domain
- Dress Code
- Greetings
- Interactions
- Acknowledgements
- Responses
- Body language
- Developing Cross-Cultural Sensitivity

References:

- *Business Communication*, ICFAI University Press
- M. Ashraf Rizvi , "*Effective Technical Communication*", Tata McGraw-Hill.
- R.C Sharma & Krishna Mohan, "*Business Correspondence & Report Writing*", Tata McGraw-Hill.
- Raymond V Lesikar Marie E Flately, Kathryn Rentz, "*Business Communication making Connections in a Digital World*", Tata McGraw-Hill.
- MeeraBanerji& Krishna Mohan, "*Developing Communication Skills*", Macmillan.
- Meenakshi Raman &Sangeeta Sharma, "*Technical Communication principles and practice*", Oxford.

Semester V/VI

PCM 209: Technical Communication

LTP: 2-0-1 **Credits: 03**

UNIT 1: Technology and Presentation **(03)**

- Presentation: Approaches and Methods
- Creating PowerPoint Presentations: Practices for Slide Design, Slide Structure, Fonts and Colors, Background, Inserting Graphics and Images, Linking Audio and Video Files, Using Multimedia, Animation and Simulations.

UNIT 2: Modern Forms of Communication: New-Media **(03)**

- Internet: Introduction, Browsing and Searching the Internet, World Wide Web
- Email: Introduction, Drafting Effective email, E-mail Etiquette
- Video Conferencing: Introduction, Advantages of Video Conferencing
- Blogs
- Social Network.

UNIT 3: Writing for Employment **(04)**

- Resume
- Job Application/Cover Letter.
- 02 Workshops

UNIT 4: Official Writing **(04)**

- Writing Effective Memos
- Writing a Proposal
- 02 Workshops

UNIT 5: Report Writing **(05)**

- Framework of a Report
- Getting Information
- Collating Information
- Types of Report
- 02 Workshops

UNIT 6: Visuals and Data Management **(03)**

- Managing data and using graphics
- Review of Writing Skills
- 02 Workshops

References:

- *Technical Communication: Principles and Practices* by Meenakshi Raman and Sangeeta Sharma, Oxford Univ. Press, 2007. New Delhi.
- *Developing Communication Skills* by Krishna Mohan, Meera Banerjee: MacMillan India Ltd. Delhi**.**
- M. Ashraf Rizvi , "*Effective Technical Communication*", Tata McGraw-Hill.
- R.C Sharma & Krishna Mohan, "*Business Correspondence & Report Writing*", Tata McGraw-Hill.
- Raymond V Lesikar Marie E Flately, Kathryn Rentz, "*Business Communication making Connections in a Digital World*", Tata McGraw-Hill.
- MeeraBanerji& Krishna Mohan, "*Developing Communication Skills*", Macmillan.
- Meenakshi Raman &Sangeeta Sharma, "*Technical Communication Principles and Practice*", Oxford.

Ongoing Syllabus of 2nd year and 3rd Year (Semester III/IV)

PCM 201: Business Correspondence

LTP: 3-0-1 **Credits: 04**

UNIT 1: Business Communication (08)

- Business correspondence: Differences between business correspondence and technical correspondence
- Nature and Scope of Technical Communication: Accuracy, Brevity, Clarity, Objectivity, Intelligibility, Relevance in communication.
- Language in a formal Domain

UNIT 2: Modern Forms of Communication: New-Media (08)

- Internet: Introduction, Browsing and Searching the Internet, World Wide Web
- Email: Introduction, Drafting Effective email, E-mail Etiquette
- Video Conferencing: Introduction, Advantages of Video Conferencing
- Blogs
- Social Network.

UNIT 3: Etiquettes and Mannerism (08)

- Self-introduction, introducing others, interaction in formal Domain
- Dress Code
- Greetings
- Interactions

- Acknowledgements
- Responses
- Body language
- Developing Cultural Sensitivity

UNIT 4: Organizational Correspondence (09)

- Minutes, Memo, Office Order
- Notices, Agendas.
- Placing Orders, Enquiry Letters

References:

- M. Ashraf Rizvi , "*Effective Technical Communication*", Tata McGraw-Hill.
- R.C Sharma & Krishna Mohan, "*Business Correspondence & Report Writing*", Tata McGraw-Hill.
- Raymond V Lesikar Marie E Flately, Kathryn Rentz, "*Business Communication making Connections in a Digital World*", Tata McGraw-Hill.
- MeeraBanerji& Krishna Mohan, "*Developing Communication Skills*", Macmillan.
- Meenakshi Raman &Sangeeta Sharma, "*Technical Communication principles and practice*", Oxford.

Semester III/IV

PCM 207: Presentation Skills

LTP: 3-0-1 **Credits: 04**

UNIT 1: Nature and Importance of Presentations (07)

- Presentation- An Importance, Nature and Importance of Presentations
- Individual and Team Presentations (Use of Team Presentations, Benefits of Team Presentations)

UNIT 2: Planning and Organizing the Presentation (07)

- Analyzing the Audience
- Analyzing the Situation
- Developing the Central Idea
- Collating Support Material (Audio and Visual Aids)
- Organizing the Presentation- Introduction, Body and Conclusion

UNIT 3: Technology and Presentation (06)

- Presentation: Approaches and Methods
- Creating PowerPoint Presentations: Practices for Slide Design, Slide Structure, Fonts and Colors, Background ,Inserting Graphics and Images, Linking Audio and Video Files, Using Multimedia, Animation and Simulations.

UNIT 4: Delivering the Presentation **(07)**

- Rehearsing the Presentation
- Self-Evaluation
- Modes of Delivery- Extemporaneous, Impromptu, Manuscript, Memorization
- Handling Questions
- TRACT Principle
- Tips to Fight Stage Fright

UNIT 5: Extempore /JAM Sessions **(03)**

UNIT 6: Case Studies Based on "The Presentation Effect". (**03)**

References:

- M. Ashraf Rizvi , "*Effective Technical Communication*", Tata McGraw-Hill.
- R.C Sharma & Krishna Mohan, "*Business Correspondence & Report Writing*", Tata McGraw-Hill.
- Raymond V Lesikar Marie E Flately, Kathryn Rentz, "*Business Communication making Connections in a Digital World*", Tata McGraw-Hill.
- Meenakshi Raman &Sangeeta Sharma, "*Technical Communication Principles and Practice*", Oxford.

Semester V/VI

PCM 301: Writing for Technical Purpose

LTP: 3-0-1 **Credits: 04**

UNIT 1: Letters **(08)**

- Structure and Lay out of a Letter
- Letters introducing self and the company
- Introducing Products and Services
- Request and Reminders
- Writing about the routine and the pleasant
- Writing about the unpleasant
- Writing to persuade
- Workshops 2

UNIT 2: Writing for Employment **(06)**

- Resume
- Job Application/Cover Letter.
- Workshops 2

UNIT 3: Official Writing **(06)**

- Writing Effective Memos
- Writing a Proposal
- Workshops 2

UNIT 4: Report Writing **(05)**

- Framework of a Report
- Getting Information
- Collating Information
- Types of Report
- Workshops 2

UNIT 5: Visuals and Data Management **(05)**

- Managing data and using graphics
- Review of Writing Skills
- Workshops 2

UNIT 6: End-Term Project **(03)**

- Reports/proposals/cases etc. (Max 2500 words)

References:

- *Business Communication*, ICFAI University Press
- *Technical Communication: Principles and Practices* by Meenakshi Raman and Sangeeta Sharma, Oxford Univ. Press, 2007. New Delhi.
- *Developing Communication Skills* by Krishna Mohan, Meera Banerjee: MacMillan India Ltd. Delhi**.**

Annexure-XXIV-B of Agenda Item no. 6.23

M.Tech.

in

Biotechnology

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Biotechnology
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Biotechnology	
School:	School of Engineering and Technology	
Name of the Course:	M.Tech. in Biotechnology	
Duration:	Two Years	
Total number of Credits:	66	
Date of Meeting of BOS:	July 12, 2012	
Members of BOS:	1. Dr. Simendra Singh, HOD	Chairman
	2. Dr. V. K. Baranwal, IARI, New Delhi	Ext. Member
	3. Dr. V. K. Tiwari	Ext. Member
	4. Dr. Pankaj Kishor Mishra, Asstt. Professor	Int. Member
	5. Mrs. Rashmi Pandita, Asstt. Professor	Int. member
	6. Mrs. Monika Jain, Asstt. Professor	Int. Member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

COURSE STRUCTURE

M.Tech. in Biotechnology

SEMESTER	Courses (L-T-P)							Lecture Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Analytical Instruments for Biotechnology (3-1-0) 4	Enzyme Technology (3-1-0) 4	Applied Genetic Engineering (3-0-0) 3	Advances in Bioprocess Engineering (3-0-0) 3	Plant Tissue Culture-I (3-0-0) 3	Foreign Language (1-0-2) 2	Practical (0-0-4) 2	6	16	2	6	24	21
II	Bio-nanotechnology (3-0-0) 3	Applied Bioinformatics (3-0-0) 3	Cell Signaling (3-0-0) 3	Structural and Functional Genomics / Proteomics (3-0-0) 3	Open Elective (3-0-0) 3	Technical Communication (1-0-2) 2	Practical (0-0-4) 2	6	16	0	6	22	19
III	Seminar (0-0-2) 2	Project (0-0-4) 4	Dissertation (0-0-15) 8					0	0	0	21	21	14
IV	Dissertation (0-0-21) 12							0	0	0	21	21	12

Total Credits - 66

LIST OF DEPARTMENTAL ELECTIVES

1. Structural and Functional Genomics
2. Proteomics

LIST OF OPEN ELECTIVES

1. Biological databases and their Management
2. Protein Engineering
3. Metabolic Network

M.Tech.

in

Biotechnology

SYLLABI

MBB 105: Analytical Instruments for Biotechnology

L T P: 3-1-0 **Credit: 4**

Unit I: Electrophoresis and Chromatography (12)

Electrophoresis: Gel electrophoresis; Isoelectric focusing; Two-dimensional electrophoresis; Immunoelectrophoresis; Capillary electrophoresis.

Chromatography: Ion-exchange chromatography; Affinity chromatography; HPLC; Gas chromatography.

Unit II: Spectroscopy (10)

Absorption and fluorescence spectroscopy; Atomic spectroscopy; Raman Spectroscopy; Circular Dichroism; X-Ray crystallography; Nuclear Magnetic Resonance.

Unit III: Medical Imaging and Spectrometry (8)

Magnetic Resonance Imaging; Tomography (Computed tomography, Single photon emission computed tomography, Positron emission tomography); Mass spectrometry.

Unit IV: Techniques in Cell Biology (10)

Optical and electron microscopy; Atomic Force Microscopy; Fluorescence microscopy; Ultracentrifugation; Dialysis; Ultrafiltration; Flow Cytometry.

Reference Books:

1. Wilson K. and Walker J., "Principles and Techniques of Biochemistry and Molecular Biology", Cambridge University Press, 2010.
2. Ninfa A.J., Ballou D.P. and Benore M., "Fundamental Laboratory Approaches for Biochemistry and Biotechnology", Wiley, 2009.
3. Sheehan D., "Physical Biochemistry: Principles and Applications", Wiley, 2009.

MBB 103: Enzyme Technology

L T P: 3-1-0 **Credit: 4**

Unit I: Introduction to Enzymes (8)
Classification; Nomenclature and EC number of enzymes; Effects of pH and temperature; Mechanisms of action and properties of enzymes; Organization of enzymes.

Unit II: Isolation and Purification of Enzymes (11)
Enzyme crystallization and Storage; Co-enzymes and co-factors; Iso-enzymes; Allosteric enzymes: models, types and kinetics; Protein: ligand, building types; Mechanism of action of dehydrogenases and kinases.

Unit III: Kinetics of Enzyme-catalyzed Reaction (11)
Enzyme-substrate complex; Enzyme action; Simple enzyme kinetics with one and two substrates; Modulation and regulation of enzyme activity; Enzyme mechanism of catalase, superoxide dismutases and peroxidases.

Unit IV: Immobilized Enzyme Technology (10)
Enzyme immobilization; Principle and kinetics of immobilized systems; Multi enzymes and their applications; Industrial processes, utilization and regeneration of co-factors; Effects of external mass transfer resistance; Analysis of intrapartide diffusion and reaction.

Reference Books:

1. Copeland R.A., “Enzymes: A Practical Introduction to Structure, Mechanism and Data Analysis”, Wiley, 2000.
2. Buchholz K., Kasche V. and Bornscheuer U.T., “Biocatalysts and Enzyme Technology”, Wiley, 2005.
3. Cook P.F. and Cleland W.W., “Enzyme Kinetics and Mechanism”, Garland Science, 2007.

MBB 108: Applied Genetic Engineering

L T P: 3-0-0 **Credit: 3**

Unit I: Tools of Genetic Engineering (10)

Molecular tools and their application; Concept of restriction and modification enzymes; Restriction endonucleases; Modifying enzymes; Ligases; Gene cloning Vectors; Prokaryotic and eukaryotic plasmid based; Bacteriophage based; Phagemids; Cosmids; YACS; BACS; PACS; Expression vectors for plant, animals and insects.

Unit II: Amplification of Gene and Cloning (12)

Optimization of PCR; Nested PCR; 5' and 3' RACE-PCR; Inverse PCR; Hybrid PCR; TAIL PCR; Different strategies of cloning, ligation and selection; Cloning of genes by PCR (gene specific and degenerate primers); Cloning interacting genes: two- and three- hybrid systems; Cloning differentially expressed genes; mRNA enrichment; Linkers, adapters and their synthesis; Library construction and screening.

Unit III: Expression (8)

Expression strategies; Vector and host engineering; Expression in bacteria, yeast, insects, mammalian cells and plants; Protein engineering and its application; Phage display; Role of gene tagging in gene analysis.

Unit IV: Applications (10)

Strategies of gene delivery; Transgenic organisms; Gene correction; Gene regulation and silencing; Methods for gene expression analysis; Types of DNA array; DNA array for global expression profile; Applications of DNA microarray: analysis of gene expression; Site directed mutagenesis; Gene knockout technology.

Reference Books:

1. Brown T.A, "Gene Cloning and DNA Analysis: An Introduction", John Wiley & Sons, 2010.
2. Old R.W and Primrose S.B., "Principles of Gene Manipulation", Blackwell Scientific Publication, 2002.
3. Dale W., von Schantz M. and Plant N., "From Genes to Genomes: Concepts and Applications of DNA Technology", John Wiley, 2011.

MBB 111: Advances in Bioprocess Engineering

L T P: 3-0-0 **Credit: 3**

Unit I: Microbial Growth **(8)**

Stocichiometry and energetics; unstructured and structured models transport and reactor process; Kinetics of cell growth; Mathematical models for substrate uptake and product formation; Plasmid stability in recombinant cell cultures; Media and air sterilization.

Unit II: Bioreactors **(12)**

Design of bioreactors; Various types of microbial and enzyme reactors; Batch, Fed batch and continuous processes; Aeration and agitation; Heat transfer; Design equations for CSTR fermenter; Monod model for a chemostat; Rheology of fermentation fluids; Scale-up of stirred tank bioreactor.

Unit III: Downstream Processing **(10)**

Downstream processing; Filtration of fermentation broths; Centrifugation; Emerging technology for cell recovery; Cell disruption; Solvent extraction; Product recovery by liquid-liquid extraction; Sedimentation; Flotation; Adsorption and Chromatography.

Unit IV: Industrial Applications **(10)**

Industrial production of alcohol, citric acid, amino acids, enzymes (amylase, proteases, cellulases), antibiotics and steroids; Microbiology of fermented milk products (acidophilus milk, yoghurt); Tea and coffee fermentation; Vinegar fermentation.

Reference Books:

1. Najafpour G.D., “Biochemical Engineering and Biotechnology”, Elsevier, 2006.
2. Doran P.M., “Bioprocess Engineering Principles”, Academic Press, 2012.
3. Katoh S. and Yoshida F., “Biochemical Engineering”, Wiley-VCH, 2009.

MBB 112: Plant Tissue Culture-I

L T P: 3-0-0 **Credit: 3**

Unit I: Introduction to Plant Tissue Culture **(10)**

Historical perspective; Totipotency; Organogenesis; Somatic embryogenesis; Artificial seed production; Micropropagation; Androgenesis and its applications in Genetics and plant breeding; Germplasm conservation and cryopreservation.

Unit II: Protoplast Culture, Somatic Hybridization and Variation **(10)**

Protoplast isolation; Culture and usage; Somatic hybridization: Methods and applications; Cybrids and somatic cell genetics; *In vitro* variations; Somaclonal and Gametoclonal variation; Spontaneous and Genetic variations.

Unit III Techniques in Tissue Culture **(10)**

Collection of material; Sterilization; Media preparation; Media manipulation; Culture maintenance and characterization; Biochemical and cytological characterization; Hardening; Field transfer of plantlets; Selection of desired transgenic *in vitro* and their establishment in the field condition.

Unit IV: Setting of PTC Laboratory **(10)**

Setting of tissue culture laboratory: Media room, sterilization and inoculation room; Environmentally controlled incubators and culture rooms; Choice of explants; Shoot and root induction; Primary and secondary hardening; Green house establishment; Problems in plant tissue culture: Contamination, Phenolics, Recalcitrance, Seasonal variations in response.

Reference Books:

1. Trigiano R.N. and Gray D.J., “Plant Tissue Culture, Development and Biotechnology”, CRC Press, 2011.
2. Gupta S.D. and Ibaraki Y., “Plant Tissue Culture Engineering”, Springer, 2010.
3. Razdan M.K., “Introduction to Plant Tissue Culture”, Science Publishers, 2003.

MBB 106: Bio-nanotechnology

L T P: 3-0-0 **Credit: 3**

Unit I: Production of Nanoparticles **(10)**

Introduction to Nanoscience and Nanotechnology; Techniques used in Nanobiotechnology: Optical Microscopy, Atomic Force Microscopy, SEM; Collision/Coalescence mechanism of primary particle formation; Nanoparticles agglomerates and aerogels; Biological production of nanoparticles: Fungi, bacteria, yeast and actinomycetes.

Unit II: Nano Structures **(10)**

Buckminsterfullerenes; Carbon nanotubes; Quantum nanodots; Dendrimers; Superparamagnet cnanoparticles; Nanorods; Nanoshells; Nanostructures: Properties and applications (mechanical, optical and electrical); DNA-based nanomechanical devices; Biosensor and Biochips.

Unit III: Nano Systems **(10)**

Biological Nanodevices; Nanosensors: Temperature sensors, smoke sensors; Sensors for aerospace and defense; Accelerometer; Pressure sensor; Night vision system; Nano tweezers; Nano-cutting tools; Integration of sensor with actuators and electronic circuitry.

Unit IV: Applications of Nanotechnology **(10)**

Use of nanoparticles as molecular imaging probes; Use of optical microscopy to study the dynamic events in cells; Nanobiotechnology for human health and food applications; Nanoparticles for drug and gene delivery; Understanding the mechanism of macromolecular interactions; Nanoparticles for cleaning environment particularly heavy metal bioremediation.

Reference Books:

1. Schmid G., “Nanoparticles: from Theory to Application”, Wiley-VCH, 2010.
2. Brodsky A.M., “Nanoparticles”, de Gruyter, 2011.
3. Hornyak G.L., Moore J.J., Tibbals H.F. and Dutta J., “Fundamentals of Nanotechnology”, CRC Press, 2008.

MBB 113: Applied Bioinformatics

L T P: 3-0-0 **Credit: 3**

Unit I: Sequence Analysis **(8)**

Sequence databases; Similarity matrices; Pairwise alignment; BLAST; Statistical significance of alignment; Sequence assembly; Multiple sequence alignment; Clustal; Phylogenetics: distance based approaches, maximum parsimony.

Unit II: Pattern Analysis in Sequences **(8)**

Motif representation: consensus, regular expressions; PSSMs; Markov models; Regulatory sequence identification using Meme; Gene finding: composition based finding, sequence motif-based finding.

Units III: Structure Prediction **(12)**

Representation of molecular structures (DNA, mRNA, protein), secondary structures, domains and motifs; Structure classification (SCOP, CATH); Visualization software (Pymol, Rasmol); Structure databases; Secondary structure prediction; RNA structure prediction; Mfold; Protein structure prediction by comparative modeling approaches (homology modelling, threading); Ab initio structure prediction.

Unit IV: Molecular Modeling and Drug Design **(12)**

Force fields and their evaluation (AMBER; Monte Carlo and molecular dynamics simulations (GROMACS); Target discovery and validation methodologies; Structure based drug design methods including computer-aided drug design (pharmacophore development); Target selection, Ligand (lead compound) design, optimization and analysis; Protein-ligand docking; QSAR; physico-chemical molecular descriptors; Discussion of drug design to drug discovery to drug development.

Reference Books:

1. Lesk A.M., “Introduction to Bioinformatics”, Oxford University Press, 2008.
2. Pevzner P. and Shamir R., “Bioinformatics for Biologists”, Cambridge University Press, 2011.
3. Zvelebil M. and Baum J., “Understanding Bioinformatics”, Garland Science, 2007.

MBB 114: Cell Signaling

L T P: 3-0-0 **Credit: 3**

Unit I: Cellular Communication (10)

Regulation of hematopoiesis; General principles of cell communication; Cell adhesion and roles of different adhesion molecules; Gap junctions; Extracellular matrix; Integrins; Neurotransmission and its regulation.

Unit: II: Signal Transduction (8)

Hormones and their receptors; Cell surface receptor; Signaling through G-protein coupled receptors; Signal transduction pathways; Second messengers; Regulation of signaling pathways; Light signaling in plants; Bacterial chemotaxis; Quorum sensing.

Unit: III. Serine/Threonine and Tyrosine Specific Protein Kinases (10)

Classification and characteristics of Protein Kinases; Substrate specificity and regulation of Protein Kinase A pathway, Phosphatidyl-3-kinase (PI3K)/Akt pathway; Protein cascades of the Mitogen-activated Protein Kinase (MAPK); Regulation of MAPK pathways by protein phosphatases and Inhibitory proteins.

Unit: IV. Signaling in Cancer (12)

Genetic rearrangements in progenitor cells; Oncogenes; Tumor suppressor genes; Cancer and the cell cycle; Virus-induced cancer; Metastasis; Apoptosis; Therapeutic interventions of uncontrolled cell growth.

Reference Books:

1. Krauss G., “Biochemistry of Signal Transduction and Regulation’, Wiley-VCH, 2008.
2. Hancock J.T., “Cell Signalling”, Oxford University Press, 2010.
3. Gomperts B.D., Kramer I.M. and Tatham P.E.R., “Signal Transduction”, Academic Press, 2009.

MBB 004: Structural and Functional Genomics

L T P: 3-0-0 **Credit: 3**

Unit I: Sequence and Genomes **(10)**

Introduction and overview; Principles of DNA sequencing; Automated DNA sequencing; Pyrosequencing; Whole genome sequencing method; Analysis of sequence data and Annotation *in silico* using bioinformatics tools and methods; Features of prokaryotic, eukaryotic and organellar genomes; Genome sizes: C value paradox.

Unit II: Functional and Comparative Genomics **(10)**

Functional Genomics

Concept of forward and reverse genomics; Investigation of gene function by reverse genomic tools (TILLING, mutagenesis).

Comparative Genomics

Comparison of plant, animal, human, microbial and other genomes; Synteny; Co-linearity; Genome evolution; Evolution of nuclear and organellar genomes; Phylogeny.

Unit III: Application of Genomics **(10)**

Application of comparative genomics; Application of genomics in crop improvement; Microbial genomics and its application in agriculture and industry; Pharmaco-genomics; Personalized medicine; Designing of vaccines and drugs.

Unit IV: Plant Genomics **(10)**

Identification of candidate genes using: genetic information (positional cloning); Biochemical and expression analysis (microarray analysis, proteomics, metabolomics); Characterization and functional analysis of candidate genes using: transformation, mutant populations, knockout systems; Heterologous expression systems; Protein analysis.

Reference Books:

1. Pevsner J., “Bioinformatics and Functional Genomics”, John Wiley and Sons, 2008.
2. Bergman N.H., “Comparative Genomics: Volume 2”, Humana Press, 2012.
3. Campbell A.M. and Heyer L.J., “Discovering Genomics, Proteomics and Bioinformatics”, Benjamin Cummings, 2006.

MBB 005: Proteomics

L T P: 3-0-0 **Credit: 3**

Unit I: Introduction to Proteomics **(10)**

The proteome and genome; Life and death of a protein; Protein modular structure; Functional protein families; Scope for proteomics and challenges of proteomics; Measurement of concentration and composition of amino acids.

Unit II: Protein Analysis **(10)**

N-terminal sequencing; 2-D electrophoresis; Microscale solution; Isoelectricusing; Peptide fingerprinting; LC/MS-MS for identification of proteins and modified proteins; MALDI-TOF; SAGE and Differential display proteomics, Protein-protein interactions, Yeast two hybrid system.

Unit III: Detection and Image Analysis of 2D Gels **(12)**

Organic dyes and silver stains; Reverse stains; Colloidal dispersion stains; Organic fluorophore stains; Metal chelate stains; Data acquisition; Digital image processing; Protein spot detection and quantitation; Gel matching; Data analysis and presentation; Protein expression profile; Identification of protein-protein interaction and protein complexes; Mapping protein complexes.

Unit IV: Functional Proteomics **(8)**

Analysis of microarray data; Protein and peptide microarray-based technology; PCR directed protein *in situ* arrays; Structural proteomics; Protein chip technology and its applications.

Reference Books:

1. Lovric J., “Introducing Proteomics: From Concepts to Sample Separation, Mass Spectrometry and Data Analysis”, Wiley, 2011.
2. Campbell A.M., “Discovering Genomics, Proteomics and Bioinformatics”, Benjamin Cummings, 2006.
3. Kessel A. and Ben-Tal N., “Introduction to Proteins: Structure, Function and Motion”, CRC Press, 2010.

OEM 009: Biological Databases and their Management

L T P: 3-0-0 **Credit: 3**

Unit I: Introduction to Databases **(10)**

Data abstraction; Data models; Basic concept of databases, Data independence DML, DCL, DDL and structure of database Management System; Entity relationship diagram: Basic and Advance concept; Application of ER diagram in designing database system.

Unit II: Biological Databases **(10)**

Nucleic acid sequence data banks; Genbank, EMBL, DDBJ, GenPept, nucleiotide sequence databank; cDNA databank, AIDS Virus sequence data bank, rRNA data bank, Protein sequence data banks, Signal peptide data bank, NBRF-PIR, SWISSPROT.

Unit III: Database Design Issues **(10)**

Normalization INF, 2NF, 3NF, 4NF, BCNF and 5NF, database design problems, Security and integrity Use of SQL for specifying, authorization, view, encryption; storage structure indexing and hashing; different types of file organization.

Unit IV: Distributed Database Structure **(10)**

Design, transparency and autonomy; Distributed query processing recovery; Commit protocol deadlock handling; Multidatabase system; Parallel database concept and related issues; Web interface to database; Database system Architecture.

Reference Books:

1. Chen J.Y. and Lonardi S., “Biological Data Mining”, Chapman and Hall, 2009.
2. Chen J. and Sidhu A.S., “Biological Database Modeling”, Artech House, 2007.
3. Cohn R. and Russell J., “Biological Databases”, VSD Publications, 2012.

OEM 010: Protein Engineering

L T P: 3-0-0 **Credit: 3**

Unit I: Properties of Proteins (10)

Protein engineering: Definition and applications; Features or characteristics of protein that can be engineered; Affinity and specificity; Spectroscopic properties; Stability to changes in parameters as pH, tempearture and amino acid sequence; Aggregation propensies.

Unit II: Methods of measuring protein characteristics (10)

Spectroscopic methods to study physicochemical properties of protein: far UV and near - UV CD; Fluorescence; UV absorbance; ORD; Hydrodynamic properties: viscosity, hydrogen-deuterium exchange; NMR spectroscopy: emphasis on parameters that can be measured/obtained from NMR and their interpretation; Methods for measuring protein stability.

Unit III: Protein Structure (8)

Forces stabilizing proteins: Van der Waals, electrostatic; Hydrogen bonding; Hydrophobic effects; Entropy-enthalpy compensation; Ramachandan map; Computational approaches to protein engineering: Sequence and 3D structure analysis; Data mining.

Unit IV: Protein Engineering (12)

Mecahnism of stabilization of protein from psychrophiles and thermophiles vis-à-vis those from mesophiles; Experimental methods of protein engineering: directed evolution like gene site saturation mutagensis; Module shuffling; Guided protein recombination; Optimization and high throughtput screening methodologies (Giga Matrix); Engineering antibody affinity by year surface display.

Reference Books:

1. Park J.S. and Cochran J.R., “Protein Engineering and Design”, CRC Press, 2009.
2. Lutz S. and Bornscheuer T., “Protein Engineering Handbook”, Wiley-VCH, 2008.
3. Müller K. and Arndt K., “Protein Engineering (Methods in Molecular Biology)”, Humana Press, 2010.

OEM 011: Metabolic Network

L T P: 3-0-0 **Credit: 3**

Unit I: Computational System Biology **(10)**

Systems Biology - a new approach to decoding life; Constructing and modeling of genetic networks; Control theory; Cellular systems biology: local activation and global inhibition models; Gradient sensing systems; Gradient sensing systems; Comparative systems biology: cross species comparison of networks.

Unit II: Biological and Metabolic Networks **(10)**

Network biology; Understanding the cell's functional organization; Reconstructing transcriptional regulatory modules and networks; Metabolic Networks: structural properties of metabolic networks; Modeling metabolic networks; Designer Networks: Engineered gene circuits.

Unit III: Metabolic Network Properties **(10)**

Metabolic control analysis; Simulation of cellular activities; Modeling and simulating environment for biochemical and genetic processes; E-cell; General framework for spinal modeling; Simulation of cellular physiology; V-cells.

Unit IV: Methods of Metabolic Pathways Analysis **(10)**

Databases of metabolic pathways; Kyoto encyclopedia of genes and genomics (KEGG); Analysis of pathways: glycolysis, signaling pathways and genetic pathways.

Reference Books:

1. Krawetz S., "Bioinformatics for System Biology", Humana Press, 2009.
2. Chen L., Wang R-S. and Zhang X-S., "Biomolecular Networks: Methods and Applications in Systems Biology", John Wiley and Sons Publications, 2009.
3. Harisha S., "Fundamentals of Bioinformatics", I K International Publications, 2007.

Annexure-XXIV-B of Agenda Item no. 6.23

M. Tech.

in

Civil Engineering with specialization in Geo-Informatics

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2012-13)

Department of Civil Engineering

SCHOOL OF ENGINEERING AND TECHNOLOGY

SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Civil Engineering	
School:	School of Engineering and Technology	
Name of the Course:	M.Tech. in Civil Engineering with specialization in Geoinformatics	
Duration:	Two years	
Total number of Credits:	68	
Date of Meeting of BOS:	July 25, 2012	
Members of BOS:	1. Prof. Satyaprakash, HoD, Civil	Chairman
	3. Prof. Ranvir Singh, DSW, Sharda	Internal Member
	4. Prof. R.L. Misri, Civil	Internal Member
	5. Prof. A.M. Chandra, Civil	Internal Member
	6. Prof. D. Goldar, Civil	Internal member
	8. Mr. Gaurav Goel, Civil	Internal member
Date of Meeting of Faculty Board:	July 25, 2012	
Status:	Syllabus approved by BOS and Faculty Board	

COURSE STRUCTURE

M. Tech. in Civil Engineering with Specialization in Geo-Informatics

SEMESTER	Courses (L-T-P) Credits							Lecture Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Basic spatial mathematics and computing (3-0-0) 3	Basic Surveying, Mapping & GNSS (3-1-0) 4	Basic Geo Informatics (3-0-0) 3	Open Elective (3-0-0) 3	Data Structure and Data models (3-0-0) 3	Foreign Language (1-0-2) 2	Basic GIS Lab (0-0-4)2	**6**	**16**	**1**	**6**	**23**	**20**
II	Digital Image Processing (3-1-0) 4	Spatial Analysis Techniques (3-1-0) 4	GIS application development (3-0-0) 3	Departmental Elective (3-0-0) 3	Advanced Digital Image Processing (3-1-0) 4	Technical Presentation (1-0-2) 2	Digital Image Processing Lab (0-0-4) 2	**6**	**16**	**3**	**6**	**25**	**22**
III	Seminar 2	Project 4	Dissertation 8					**0**	**0**	**0**	**-**	**-**	**14**
IV	Dissertation 12							**0**	**0**	**0**	**-**	**-**	**12**

L-lecture, T-tutorial, P-practical

List of Departmental Electives:

- Applications of Geoinformatics in Urban Planning
- Applications of Geoinformatics in Environmental Management
- Applications of Geoinformatics in Disaster Management
- Applications of Geoinformatics in Hydrology and Water Resources Management
- WebGIS

List of Open Electives:

- Basics of programming using C and C++
- Project Management and Entrepreneurship
- Open Geo Informatics

M. Tech.

in

Civil Engineering

With specialization in

Geo Informatics

SYLLABI

MGI 101: Basic Spatial Mathematics and Computing

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(10)**

Data collection and sources, Describing data, Measurement of data, Statistical concepts, Descriptive statistics, Probability, Sampling, Inferential Statistics, Correlation and Regression Analysis, Time series Analysis, Factor Analysis and Principal Component Analysis.

Books and References:

1. Cole.J.P and C.A.M. King – Quantitative Geography, Willey International, New York, 1968.
2. Gregory, S. Statistical methods and the Geographer, London, 1963.
3. R. Hammond, R & McCullagh P.S. (1978), "Quantitative techniques in Geography – An Introduction Clarenelon Press – Oxford University Press.
4. Rogerson, P. (2006) Statistical Methods for Geography (2nd ed), Sage: London
5. McGrew, J. C. and C. B. Monroe (2000) An Introduction to Statistical Problem Solving in Geography, 2nd edition, McGraw Hill: Boston
6. Isaaks, Edward, H. and R. Mohan Srivastava. 1989. An Introduction to Applied Geostatistics. Oxford University Press, New York
7. Shaw, P. J. A. 2003. Multivariate statistics for the environmental sciences. London: Hodder Arnold.
8. Mitchell, A. 1999. The ESRI guide to GIS analysis. Volume 2: Spatial Measurements and Statistics. Redlands, Calif.: ESRI Press.
9. Fotheringham, A.S., Brunsdon, C., and Charlton, M. (2002) Quantitative Geography: Perspectives on Spatial Data Analysis, Sage: London
10. Wong, D. and Lee, J. (2005) Statistical Analysis of Geographic Information with ArcView GIS and ArcGIS , Wiley: Hoboken
11. Cressie N. A. C.: Statistics for Spatial Data, John Wiley & Sons, Inc. New York, 1993.
12. King L.J. Statistical analysis in Geography, Prentice Hall, New Jersey, 1969.
13. Duman C.D. et.al. Statistical Geography, Fress Press, London 1961.
14. David Ebdon – Statistics in Geography – A Practial approach, Basil Blackwell, Oxford, 1978.

Unit 2 **(15)**

Introduction to computer architecture: memory, ALU, CPU, I/O devices. Introduction to system software; operating systems, compilers and multi-user environments. Algorithms, Use of high level programming language, design and implementation of programs. Notions of syntax and semantics of programming languages; introduction to operational/ natural semantics of functional and imperative languages. Evolution and architecture of DB systems.

Unit 3 **(15)**

The E-R Model, Database models, Representation and Evaluation of Relationship, The Relational Database Model and operations on the same, Functional Dependencies, Multi-valued and join Dependency, Normaliztion Theory, Concurrency Control in Relational Databases, Object Oriented Data Models.

Books and References:

1. Michael Miller, 2004. Absolute Beginner's Guide to Computer Basics, Second Edition, Que Publishers. (ISBN-10: 0-7897-3175-4)
2. Ramez Elmasri and Shamkrant Navathe, 2010. Fundamentals of Database Systems, Addison Wesley Publishers, (ISBN-10: 0136086209)
3. Greg Perry, Sams Teach Yourself Beginning Programming in 24 Hours, Sams Publishing. ISBN-10: 0672323079
4. Alexander Stepanov and Paul McJones, 2009. Elements of Programming, Addison-Wesley Professional. (ISBN-10: 032163537X)
5. Joe Kraynak http://www.amazon.com/Complete-Idiots-Guide-Computer-Basics/dp/1592575978/ref=pd_sim_b_8 - #, 2007. The Complete Idiot's Guide to Computer Basics, 4th Edition, Alpha Publishers, (ISBN-10: 1592575978)
6. Dan Gookin, 2007. PCs For Dummies, For Dummies Publishers, (ISBN-10: 0470137282).
7. Allen G. Taylor, 2000. Database Development for Dummies (Paperback), For Dummies Publishers (ISBN-10: 0764507524)
8. Jerry Lee Ford Jr., 2007. Programming for the Absolute Beginner (No Experience Required, Course Technology Publisher s, (ISBN-10: 1598633740)
9. John Petersen, 2002. Absolute Beginner's Guide to Databases (Paperback), Que Publishers (ISBN-10: 078972569X)

MGI 102: Basic Surveying and Mapping

L-T-P: 3-1-0 **Credits: 4**

Unit 1 **(30)**

Basics of Geodesy, map co-ordinate system and map projections, Datum, Longitude, Latitude, Theory of measurements, Methods of collecting and recording data, Use of data collectors, Concepts of Cartography - Overview and History, Concepts of Cartography, Automated Mapping, Real-time Mapping, Scale, Projections, Maps, Types of maps, Digital cartography, Digital mapping, Map generalisation.

Books and References:

1. G.Bomford; Geodesy, Oxford: Clarendon Press, 1962.
2. T.P Kanetkar and S.V Kulkarni,, Surveying and Levelling Vol I & II, Pune Vidyarthi Gruh
3. K.R. Arora, Surveying Vol I & II, Standard Book House. New Delhi
4. Jones, Christopher. 1997. Geographical Information Systems and Computer Cartography, Addison Wesley Longman Limited, Edinburgh Gate, England.
5. Robinson, Arthur H., Morrison, Joel L., Muehrcke, Phillip C., Kimerling, A. Jon, and Stephen C. Guptill. 1995. Elements of Cartography, 6th ed., John Wiley and Sons, Toronto.
6. Slocum, Terry A. 1999. Thematic Cartography and Visualization, Prentice-Hall Inc., Upper Saddle River, New Jersey.
7. A. H. Robinson et.al.: Elements of Cartography, John Wiley & Sons, Inc., 1984.
8. P.A. Burrough: Principles of Geographical Information Systems for Land Resources Assessment, Oxford Science Publications, 1986.
9. Geodesy for the Layman, A report by DMA, USA, 1984. http://www1.nga.mil/ProductsServices/GeodesyGeophysics/Related%20Documents/Geo4lay.pdf
10. R. W. Anson: Basic Cartography, Elsevier Applied Science Publishers, 1984.
11. Campbell, John. 2001. Map Use & Analysis, 4th ed., McGraw-Hill Higher Education, Toronto.
12. Dent, Borden, D. 1999. Cartography, Thematic Map Design, 5th ed., McGraw-Hill Higher Education, Toronto.

13. Slocum, Terry A., McMaster, Robert B., Kessler, Fritz C., and Hugh H. Howard. 2005. Thematic Cartography and Geographic Visualization, 2nd ed., Prentice-Hall Inc., Upper Saddle River, New Jersey.

Unit 2 **(10)**

GNSS – GPS and other satellite based positioning systems, Laser Range Scanners – Airborne and Ground based, Range Image generation and processing, Mobile Mapping – systems and capabilities, process, limitations and applications.

Books and References:

1. Gregory T. French: Understanding the GPS, Georeasearch Publications, 1997.
2. P.A. Longley et.al.,: Geographical Information Systems (Vol.I and Vol.II), John Wiley & Sons, Inc., 1999.
3. Steve Dye and Frank: The GPS Manual, Baylin Publications, 1997.
4. R. Li and S. Murai: Proceedings of International Workshop on Mobile Mapping Technology, Bangkok, Thailand, 1999.

MGI 103: Basic Geo-Informatics

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(15)**

Introduction, History of GIS, Applications and trends of GIS, Component of GIS, GIS Software Architecture, Types of GIS software, Spatial and Non-spatial concept, Vector, Vector Topology, Raster, Georeferencing, Sources of raster and vector data, Scale and Resolution.

Books and References:

1. DeMers, M.N., "Fundamentals of Geographic Information System", 3rd Ed., John Wiley. 2005
2. Chang, K. (2007) Introduction to Geographic Information System, 4th Edition. McGraw Hill.
3. Longley, P.A., Goodchild, M.F., Maguire, D.J. and Rhind, D.W. (2005) Geographic Information Systems and Science. Chichester: Wiley. 2nd edition.
4. Tomlinson, R.F., (2005) Thinking About GIS: Geographic Information System Planning for Managers. ESRI Press. 328 pp.
5. Burrough, P.A. and McDonnell, R.A., "Principles of Geographic Information for Land Resources Assessment", Oxford University Press. 1998
6. Maguire, D.J., Batty, M. and Goodchild, M. (Eds.)., "GIS, Spatial Analysis and Modelling", ESRI Press. 2005
7. Bolstad, P. (2005) GIS Fundamentals: A first text on Geographic Information Systems, Second Edition. White Bear Lake, MN: Eider Press, 543 pp.
8. Wise, S. (2002) GIS Basics. London: Taylor & Francis.

Unit 2 **(25)**

History and Elements of Remote Sensing, Satellite Remote Sensing & Sensors, Energy interactions with the Earth surface, Spectral signatures, Remote Sensing Systems, Resolution of images, Various satellite systems and monitoring programs, Data Products, Satellite data, Data formats, Data acquisition Basic image interpretation, Scale, resolution & accuracies of satellite images, Random errors and least square adjustment, Coordinate transformation, Multispectral & Thermal Remote Sensing, Microwave Remote Sensing, Remote Sensing Applications

Books and References:

1. Legg, C.A., "Remote Sensing and Geographic Information System", John Wiley. 1999

2. Campbell, J.B. (2002). Introduction to remote sensing, 3rd ed., The Guilford Press. ISBN 1-57230-640-8.
3. Joseph, George Fundamentals of Remote Sensing Universities Press India
4. Lillesand, T.M.; R.W. Kiefer, and J.W. Chipman (2003). Remote sensing and image interpretation, 5th ed., Wiley. ISBN 0-471-15227-7.
5. Richards, J.A.; and X. Jia (2006). Remote sensing digital image analysis: an introduction, 4th ed., Springer. ISBN 3-540-25128-6.
6. John A. Richards and Xiuping Jia, (2006), Remote Sensing Digital Image Analysis: An Introduction, Springer (ISBN-10 3-540-25128-6)
7. Asrar Ghassem Theory and applications of optical remote sensing New York: John Wiley and Sons
8. Curran Paul J Principles of Remote Sensing UK: ELBS,
9. Jensen, J.R. (2000). *Remote sensing of the environment: an Earth resource perspective*. Prentice Hall. ISBN 0-13-489733-1.
10. Kondratyev K Ya, Buznitov AA and Pokrovoky OM Global Change and Remote Sensing: John Wiley and Sons.
11. Muralikrishna V Geographical Information Systems and Remote Sensing Applications Allied Publsihers Private Limited
12. Jensen, J.R. (2005). Digital Image Processing: a Remote Sensing Perspective, 3rd ed., Prentice Hall.
13. Sabins Floyd F Remote Sensing: Principles and Interpretation New York: WH Freeman and Company.

MGI 104: Data structure and Data models

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(15)**

Basic data structures and their realization in object oriented environments, Data structures for maintaining ranges, intervals and disjoint sets with applications. Basic algorithmic techniques like dynamic programming and divide-and-conquer. Sorting algorithms with analysis, integer sorting, and selection. Graph algorithms like DFS with applications, MSTs and shortest paths.

Books and References:

1. Alfred V. Aho, Jeffrey D. Ullman and John E. Hopcroft, 1983. Data Structures and Algorithms (Paperback), Addison Wesley, (ISBN-10: 0201000237)
2. Handbook of Algorithms and Data Structures: Book For Algorithms and Data Structures (http://www.bestebooksworld.com/ebook/11548/)
3. Bruno R. Preiss, Data Structures and Algorithms with Object-Oriented Design Patterns (http://www.brpreiss.com/books/opus5/)

Unit 2 **(10)**

Evolution and architecture of DB systems, DB models, Relational DB model, operations on the relational model. The database language SQL, constraints and triggers in SQL, system aspects of SQL, Object-oriented query languages, XML databases.

Books and References:

1. Clare Churcher, 2007. Beginning Database Design: From Novice to Professional; Apress; 1st ed. (ISBN-10: 1590597699)
2. Michael J. Hernandez, 2003. Database Design for Mere Mortals: A Hands-On Guide to Relational Database Design, Addison-Wesley Professional (ISBN-10: 0201752840)
3. Len Silverston, 2009. The Data Model Resource Book, Vol. 1. Wiley. (ISBN-10: 0471380237)
4. Len Silverston, 2009. A Library of Universal Data Models for All Enterprises (Paperback); Vol. 2: A Library of Universal Data Models for Industry Types; Vol. 3: Universal Pattern for Data Modeling, Wiley. (ISBN-10: 0471380237)
5. http://www.databaseanswers.org/modelling_books.htm

Unit 3: GIS Data model **(15)**

Raster based GIS. Spatial referencing in raster based GIS: definition and representation of raster data, concepts of raster based GIS data structure, data capture and basic operations of spatial analysis with raster GIS. Vector based GIS: Definition, concepts of vector based GIS, data

structures, data capture and operations of spatial analysis with vector GIS. Advantages and disadvantages in raster and vector based GIS.

Books and References:

1. Hugh W. Calkins, ENTITY-RELATIONSHIP MODELING OF SPATIAL DATA FOR GEOGRAPHIC INFORMATION SYSTEMS; http://www.geo.unizh.ch/oai/spatialdb/ergis.pdf
2. David Arctur and Michael Zeiler, 2004. Designing Geodatabases : Case Studies in GIS Data Modeling. ESRI Press (ISBN: 9781589480216)

OEM 006: Project Management and Entrepreneurship

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(12)**

Introduction to Management Theory; the system approach to management. Systems methodology. Management style. Managers and their external environment. Introduction to planning: Nature and scope of planning, Type of planning, Long and short-term plans. Decision-making. Systems approach to decision-making. Organizing: Basic departmentation. Line and staff authority relationships. Functions of leadership, Nature of leadership, Control: The system and process of control, Control techniques, Control of overall performance. Introduction to functional areas of management: Operation Management, Financial Management, Marketing Management, Human Resources Management and Organization Management.

Unit 2 **(5)**

Project lifecycle; Project initiation and management; Information delivery, data sharing, total project cost calculation and cost-benefit analyses of GIS projects

Unit 3 **(8)**

The Operating cycle; Market Segmentation; Market Research; Test Marketing; Essentials of Costing & Pricing; Working Capital Management; Break even Analysis; Product Development; Production Planning and Control; Materials Management; Selection and Recruitment Group Dynamics; Delegation; Industrial Policy; Project Identification; Techno Economic Feasibility Report. Entrepreneurship in India;

Unit 4 **(15)**

Self employment need and mode. Structural base of Indian economic life. Industrial sector in the national developmental life. Indices of technical entrepreneurship. Opportunity identification and opportunity generation for technical entrepreneurship. Problem solving, decision making, conflict and change in a new industrial enterprise. Systems consideration in an entrepreneurial venture. Management reporting and information systems of a new business enterprise. Preparing for an entrepreneurial career. Issues in resource management. Managing innovations.

Books and References:

1. Aronoff, Stan. 1989. Geographic Information systems: A Management Perspective, WDL Publications, Ottawa, 294pp.
2. Peter L. Croswell, 2009. The GIS Management Handbook. Kessey Dewitt Publications in association with URISA. ISBN13: 978-0-9824093-0-5

OEM 007: Open Geo-Informatics

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(15)**

Commercial vs Open source software; Development of Open source software – History and development; Open source definition; Open source licenses – by category, by name, by review process; Open standards – requirement, compliance, rationale; Open source case for business.

Unit 2 **(25)**

Need of Open source software; Some open source software – GRASS, Quantum, ENVI, Autodesk Mapguide; Open source GIS projects – OSRS, FreeGIS.org; Metalab Linux Archive, Fresh Meat.net; Tools under opensource; OGC – About, mission and vision; OGC standards; Registered products; Benefits to the community.

Books and References:

1. Gary Sherman, 2008. Desktop GIS: Mapping the Planet with Open Source. Pragmatic Bookshelf. (ISBN: 1934356069)
2. Hall, G. Brent; Leahy, Michael G, 2008. Open source approaches in Spatial data handling, Springer (ISBN: 978-3-540-74830-4)
3. Markus Neteler and Helena Mitasova, 2008. Open Source GIS: A GRASS GIS Approach. Third Edition. Springer, New York (ISBN: 978-0-38735767-6)
4. Tyler Mitchell, 2005. Web Mapping Illustrated: Using Open Source GIS Toolkits. O'Reilly.(ISBN: 9780596008659)
5. http://www.fsf.org
6. http://www.osgeo.org
7. http://www.opengeospatial.org
8. http://www.foss4g.org
9. http://www.freegis.org
10. http://www.remotesensing.org
11. http://www.opensourcegis.org

OEM 008: Basic Programming using C and C++

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(10)**

Introduction to C programming, Overview, features and structure of C Program, Constants, Variables and Data types, Operators and Expressions, Control Flow (Branching and Looping), Selection, Iteration.

Unit 2 **(15)**

Functions, Program structure and Unions, Arrays, Strings, Pointers and Structures, Input and Output, File Management, Introduction to Object oriented programming.

Unit 3 **(15)**

C++ Programming, Introduction to objects and classes; Object hierarchy; Inheritance; polymorphism; Operator overloading; Templates; Virtual Class and Friend Class

Books and References:

1. Brian W. Kernighan, Dennis M. Ritchie (1988). Programming Language, Princeton Hall (ISBN 0-13-110362-8)
2. Yashvant P Kanetkar. (2008) Let Us C . Infinity Science Press
3. Stephen G. Kochan (1994), Programming in ANSI C, SAMS Publishing (ISBN 0-672-30339-6)
4. E. Balagurusamy. (2007). Programming in ANSI C, Tata Mcgraw Hill (ISBN 0-070-64822-0).
5. Schildt, H. (2003). C++: The complete reference (4th Edition), Tata-McGraw Hills (ISBN 9780070532465).

Stroustrup, B. The C++ programming language, Addison-Wesley, (ISBN: 0-201-88954-4)

MGI 105: Digital Image Processing

L-T-P: 3-1-0 **Credits: 4**

Unit 1 **(8)**

Image representation and Preliminaries - Image and Digital images: Different types of images and acquistion (like real images, aerial images, etc.), simple image model, sampling and reconstruction - uniform sampling and quantisation - Information on image formats - Graphic representation on theory, RLE, LZW, DCT, BIVIP, TIFF, GIF, PIX, JPEG etc.

Unit 2 **(15)**

Digital Analysis - image rectification and restoration: Radiometric, atmospheric and geometric corrections, correction in the spatial spectrum of the images. image enhacement - Contrast manipulation, Gray-level thresholding, level slicing, and contrast stretching, Spatial feature manipulation - Spatial filtering, edge enhacement and fourier analysis. Mult-image manipulation - Multispectral band ratio and differencing, principal components, canonical components, vegetation components, and intensity-hue-saturation (HIS) colour space transformation.

Unit 3 **(17)**

Image classification, Supervised classification - the classification stage, minimum distance to mean classifier, parallelepiped classifier, Gaussian maximum likelihood classifier and the training stage, Unsupervised classification - output stage, graphic products, tabular data, post classification smoothing, Classification Accuracy Assessment, Data merging - multitemporal data merging, change detection procedures, multisensor image merging, merging of image data with ancillary information.

Books and References:

1. Remote Sensing and Image Interpretations by Thomas. M. Lillesand and Ralph W. Kiefer., John Wiley and Sons, New York, 1994.
2. Digital Image Processing, Prentice by Kenneth, R. Castleman, Prentice - Hall, 1979.
3. Remote Sensing, Principles and Interpretations by Sabins. F.F, 2nd Ed. W.H. Freeman and Company, New York, 1986.
4. Techniques for Image Processing and classification in Remote Sensing by Schowengerd, R.A, Academic Press, New York.
5. Digital Image Processing for Remote Sensing by Bernstein. R, IEEE Press, New York, 1978.
6. Computer Imaging, Recipes in C by Hardley, R., Myler and Arthur . Weeks, C.Engel Wood Cliffs, New Jersey, Prentice Hall Publishing, 1993.

7. Remote Sensing - Quantitative Approach by Phillip, Swain & Shirleym Davis, McGraw Hill, USA.
8. Manual of Remote Sensing Vol. I & II, American Society of Photogrammetry, 4th Ed, Falls Chjurch, 1980.
9. Image Processing for Remote Sensing by Robert. M, Haralick and Simmonentt, 1983.
10. Satellite Remote Sensing for Natural Resources by Verbyla D., Lewis Publishers, Baca Rotaon Fl., 1995.
11. Modem Image Processing, Wrapping and Classification Techniques by Watking, Sadun, Marenka.

MGI 106: Spatial Analysis Techniques

L-T-P: 3-1-0 **Credits: 4**

Unit 1 **(4)**

Conceptual Frameworks for Spatial Analysis - The geospatial perspective, Basic Primitives, Spatial Relationships, Spatial Statistics, Spatial Data Infrastructure.

Unit 2 **(6)**

Methodological Context - Spatial analysis as a process, Analytical methodologies, Spatial analysis and the PPDAC model, Geospatial analysis and model building, The changing context of GIScience

Unit 3 **(12)**

Building Blocks of Spatial Analysis - Spatial Data Models and Methods, Geometric and Related Operations, Queries, Computations and Density, Distance Operations, Directional Operations, Grid Operations and Map Algebra

Unit 4 **(10)**

Data Exploration and Spatial Statistics - Statistical Methods and Spatial Data, Exploratory Spatial Data Analysis, Grid-based Statistics, Point Sets and Distance Statistics, Spatial Autocorrelation, Spatial Regression

Unit 5 **(8)**

Network and Location Analysis - Introduction to Network and Location Analysis, Key Problems in Network and Location Analysis, Network Construction, Optimal Routes and Optimal Tours, Location and Service Area Problems, Arc Routing. Geocomputational methods and modeling - Introduction to Geocomputation, Geosimulation, Artificial Neural Networks (ANN), Genetic Algorithms and Evolutionary Computing

Books and References:

1. Geospatial Analysis - a comprehensive guide. 3rd edition © 2006-2009 de Smith, Goodchild, Longley (ISBN 13: 9781848761582: soft cover version; ISBN 13: 9781848761575: hard cover version); www.spatialanalysis.com
2. Fischer, M., H. Sholten, and D. Unwin, 1997. Spatial Analytical Perspectives on GIS, Taylor & Francis, Bristol, P.A., 224 p.
3. A Stewart Fotheringham and Peter A. Rogerson; The SAGE Handbook of Spatial Analysis, ISBN : 978-1-4129-1082-8, SAGE publications

4. David Maguire, Michael Batty and Michael Frank Goodchild; GIS, Spatial Analysis and Modeling; ISBN: 9781589481305; ESRI press
5. Andy Mitchell, The ESRI Guide to GIS Analysis: Vol II: Saptial Measurements and Statistics; ESRI Press.
6. Roger Tomlinson, Thinking about GIS: Geographic Information System Planning for Managers, ISBN: 1-58948-070-8; ESRI Press
7. M. O. Ball, T. L. Magnanti, Clyde L. Monma, George L. Nemhauser; Handbooks in Operations Research and Management Science, 8: Network Routing; ISBN: 0-444-82141-4. Elsevier Science
8. Stephen Wise , GIS Basics, ISBN:0-203-16454-7 ; Taylor and Francis 2002
9. Matt Duckham and Michael Worboys; GIS: A Computing Perspective, Second Edition; ISBN: 9780415283755; CRC Press
10. Fotheringham, A.S, C. Brunsdon, M. Charlton, 2002. Geographically Weighted Regression: the analysis of spatially varying relationships, New York: John Wiley & Sons
11. Fischer, M., H. Sholten, and D. Unwin, 1997. Spatial Analytical Perspectives on GIS, Taylor & Francis, Bristol, P.A.

MGI 107: GIS Application Development

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(10)**

Getting started with ArcObjects - Classes, class libraries, COM, query interface; The ArcGIS application framework - Customise dialog box, Visual Basic Editor; Working with maps and layers - Active data frame, Layer properties; Accessing data with ArcObjects - Accessing existing data using ArcObjects; Displaying data - Feature and raster data rendering; Working with queries and selections - Cursors and feature cursors, Selection sets

Unit 2 **(20)**

Geometry and spatial analysis - Spatial analysis, spatial reference, buffering; Data creation and editing - Creating new data, Editing using cursors; Geoprocessing - Running geoprocessing tools, Setting environments; Working with layouts - Making maps, adding elements, exporting and printing; ArcObjects beyond the basics - Extending applications, ArcGIS Engine, ArcGIS Server

Unit 3 **(10)**

The VBA development environment, The VBA Programming Language, Debugging and Error Handling, Development environment, COM basics, COM Interfaces, Developing COM Applications, ArcObject Basics, ArcObject Elements, Developing ArcGIS applications with ASrcObjects, Customizing ArcMap User Interface, The ArcMap Object Model, Using Maps, Using Layers, Using Data windows, Using Page Layouts.

Books and References:

1. Zhi-Jun Liu, David Percy, and Larry V. Stanislawski, 2010. GIS Programming: Concepts and Applications
2. Amir H Razavi, 2004. ARC/GIS Developer's Guide for VBA OnWord Press, ISBN-13: 978-1401891077
3. Getting to Know ArcObjects: Programming ArcGIS with VBA by Robert Burke, 2003 (ESRI Press. ISBN: 1-58948-018-x)
4. Programming ArcObjects with VBA: A Task-Oriented Approach (2nd Edition) by Kang-Tsung Chang, 2007 (CRC Press. ISBN: 0-8493-9283-7).
5. Bruce Ralston , 2001. Developing GIS Solutions With MapObjects and Visual Basic, OnWord Press, ISBN-13: 978-0766854383

MGI 108: Advanced Digital Image Processing

L-T-P: 3-1-0 **Credits: 4**

Unit 1 **(25)**

Review of basic digital image processing - Spatial domain image processing, Frequency domain image processing; Computerized tomographic imaging - History and applications of computed tomography, Mathematics underlying computerized tomographic imaging, Methods of forming a computed tomography image; Color models, representation, and image processing - RGB, CMYK, HSI models, and pseudocolor, YIQ, YUV, YPbPr, YCbCr, color models versus video/monitor standards (e.g., NTSC, PAL, SECAM, composite, S-video, component, VGA, ATSC, DVB, DVI, HDMI; interlaced versus progressive scanning; SD versus HD), Color transformations, Color image filtering and enhancement; Wavelets and multiresolution processing - Multiresolution representations, Subband coding and filter banks, bandpass sampling, Wavelet transforms in 1-D and 2-D;

Unit 2 **(15)**

Image compression - Information content (entropy) of an image, Lossless versus lossy compression algorithms, Compression standards (including the new JPEG XR, compressive sampling; Morphological image processing - Intro to image morphology, Binary operations, Grayscale operations, Applications of morphological image processing; Image segmentation - Edge detection, Edge linking and boundary detection, Thresholding, Other methods of segmentation; Image representation and object recognition - Descriptors: boundaries, regions, global, Pattern recognition as applied to images.

Books and References:

1. R. C. Gonzalez and R. E. Woods, Digital Image Processing. Prentice Hall, 3rd ed., 2008.
2. W. K. Pratt, Digital Image Processing. John Wiley & Sons, 3rd ed., 2001.
3. K. Aizawa, K. Sakaue, and Y. Suenaga, eds., Image Processing Technologies: Algorithms, Sensors, and Applications.
4. A.K.Jain, Fundamentals of Digital Image Processing, Prentice-Hall, 1989.
5. J. C. Russ, The Image Processing Handbook. CRC Press, 5th ed., 2006.
6. A. C. Kak and M. Slaney, Principles of Computerized Tomographic Imaging. SIAM Press, 2001.
7. S. E. Umbaugh, Computer Imaging: Digital Image Analysis and Processing. CRC Press, 2005.
8. A.M.Tekalp, Digital Video Processing, Prentice-Hall, 1995.
9. A.Bovik, Handbook of Image Video Processing, Academic Press, 2000.

10. H.Stark and J.W.Woods, Probability, Random Processes, and Estimation Theory for Engineers, Prentice-Hall, 1994.
11. A.M.Yaglom, Correlation Theory of Stationary and Related Random Functions I: Basic Results, Springer-Verlag, 1987.
12. L.Breiman, Probability, SIAM, 1992.
13. H.V.Poor, An Introduction to Signal Detection and Estimation, 2nd Ed., Springer-Verlag, 1994.
14. A.Gersho and R.M.Gray, Vector Quantization and Signal Compression, Kluwer, 1992.
15. M.Vetterli and J.Kovacevic, Wavelets and Subband Coding, Prentice-Hall, 1995.

MGI 011: Applications of Geo-Informatics in Urban Planning

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(5)**

Relevance of remotely sensed data for Urban & Regional Analysis and Planning - Identification of settlement features from aerospace images - Visual and digital analysis techniques - Scale and Resolution concepts - Scope and limitations.

Unit 2 **(10)**

Regional Mapping - City Mapping - Intra - city Mapping-Methodology - Base map preparation - Delineation of area - Change Detection and mapping - classification - Urban fringe - CBD - Urban sprawl - Case studies.

Unit 3 **(5)**

Regional plan - Master plan - Detailed Development plan - Objective and contents - Delineation of planning area - Methodology - Integrated plans - Case studies.

Unit 4 **(8)**

Urban growth analysis - Slum development - House typology - Site selection for urban development - Density analysis - Population estimation - Transportation network analysis - Case studies.

Unit 5 **(12)**

GIS - Data Input - Storage - Retrieval - Suitability of GIS software for Urban analysis - Modeling with GIS - Decision support systems for Urban Regional analysis.

Books and References:

1. Margaret Roberts, An Introduction to Town Planning Techniques, Hutchinson, London 1980
2. Brench M.C., City Planning & Aerial Information, Harvard University, Cambridge, 1971
3. NC Gautam, Urban landuse Interpretation through Arial Photograph Interpretation, NRSA
4. IRS RS Applications to Urban Planning and Development Institute of Remote Sensing

MGI 012: Applications of Geo-Informatics in Environment Management

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(10)**

Water - Air - Land - Marine Environment Global Climatologic, urban Environment: Role of RS in different types of Environments - Air, Water, Land.

Unit 2 **(15)**

GIS for - marine environment, urban environment. Introduction-spectral characteristics of water, soil, rock-water parameter, pollution studies.

Unit 3 **(15)**

GIS for - soil erosion - Land degradation - Ecology - degradation - Coastal marine studies - water Quality, monitoring and management.

Books and References:

1. Lintz, J. and Simonet, Remote Sensing of Environment, Addison Wesley Publishing Company, 1994
2. Lilliesand, T.M. and Kiefer, R, W., Remote Sensing and Image Interpretation, John Wily and sons, 1994
3. Burrough, P.A. and, McDonnell, R.A., Principles of Geographical Information Systems, Oxford University Press, 1988

MGI 013: Applications of Geo-Informatics in Disaster Management

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(4)**

Basic concepts and principles - Hydrological and geological disasters, Role of Government administration, NGO's - International disaster assistance - Sharing techno - logy and technical expertise.

Unit 2 **(4)**

Needs and approach towards prevention - Principles and components of mitigation - Disaster legislation and policy - Cost effective analysis - Utilisation of resources - Training - Education - Public awareness - Roles of media.

Unit 3 **(8)**

Dams, Bridges, Hospitals, Industrial structures, Disaster resistant structures - Low cost housing for disaster prone areas - Cyclone shelter projects and their implications - Reconstruction after disasters.

Unit 4 **(10)**

Remote Sensing Application - Risk assessment - Damage assessment - Land use planning and regulation for sustainable development - Use of Internet – Communication Network -Warning system - Post disaster review - Case studies.

Unit 5 **(12)**

Vulnerability analysis of infrastructure and settlements - Pre-disaster and post disaster planning for relief operations - Potential of GIS application in development planning and Disaster management plan - Case studies.

Books and References:

1. Bell, F.G. Geological Hazards: Their assessment, avoidance and mitigation. E & FN SPON Routledge, London. 1999
2. David Alexander, Natural Disasters, UCL Press, London, Research Press, New Delhi, 1993
3. Nick Carter. W. Disaster Management - A Disaster Manager's Handbook. Asian Development Bank, Philippines. 1991
4. Mitigating Natural Disasters, Phenomena, Effects and options, A Manual for policy makers and planners, United Nations. New York, 1991

5. George G. Penelis and Andras J. Kappos - Earthquake Resistant concrete Structures. E & FN SPAN, London, 1997.

MGI 014: Applications of Geo-Informatics in Hydrology and Water Resource Management

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(8)**

Hydrological cycle - Estimation of various components of hydrological cycle - rainfall, runoff, evaporation, transpiration, evapotranspiration – crop evapotranspiration - depression and interception loss - infiltration and percolation losses.

Unit 2 **(4)**

Watershed - watershed Divide - streams - types - stream networks - morphometric analysis - linear, area, relief aspects - floods - flood estimation and control - case studies.

Unit 3 **(4)**

Mapping of snow covered area -- soil moisture area - drought affected area - flood inundated area - case studies.

Unit 4 **(6)**

Types of Aquifers - formations - confined and unconfined aquifers - types of wells - types of tube wells - Assessment of Groundwater potential zones and Groundwater mapping.

Unit 5 **(6)**

Water harvesting structures in-situ and Ex-situ - Mapping and monitoring of catchment and command area - Water logging and salt affected mapping - Land use/ Land cover mapping - Geological and Structural Mapping - Reservoir Sedimentation - sedimentation control.

Unit 6 **(12)**

Data capture for simulation of land surface processes, inventory, Geomorphology, Landuse classification, Landuse planning and landcover mapping, Flood plain mapping, Flood plain zoning, Principles of remote sensing and its applications in water resources, agriculture and environmental monitoring, Applications in snow and glacier studies, Snow line, Ice cover, Snow-pack properties, Integrated use of remote sensing and GIS, Database preparation and Decision support analysis, Estimation of damages due to hydrologic extremes and preparation of contingency plans, Case studies.

Books and References:

1. C.S. Agarwal and P.K. Garg. Text Book on Remote Sensing in Natural Resources, Monitoring and Management.2000. Wheeler publishing Co & Ltd., New Delhi
2. Chow, V.T. Hand Book of Applied Hydrology, McGraw Hill, New York, 1964
3. V.V.N. Murty. Land and Water Management Engineering, Kalyani Publishers, New Delhi - 2002
4. H.M. Raghunath. Hydrology - Principles - Analysis - Design. New Age International Publishers, New Delhi. 2006

MGI 105: Web-GIS

L-T-P: 3-0-0 **Credits: 3**

Unit 1 **(5)**

Introduction to Digital Mapping - The Power of Digital Maps, The Difficulties of Making Maps, Different Kinds of Web Mapping; Digital Mapping Tasks and Tools - Common Mapping Tasks, Common Pitfalls, Deadends, and Irritations, Identifying the Types of Tasks for a Project; Converting and Viewing Maps - Raster and Vector

Unit 2 **(15)**

Web GIS Overview & Demo and Web Basics; Client/Server Processing and Programming, HTML Basics & Tables, HTML Frames & Forms, JavaScript Programming - basics of adding programming functionality to web pages, where Javascript can be inserted, operators and statements, Document Object Model, methods and properties, events, events handler and reference to events; OpenEV, MapServer, Geospatial Data Abstraction Library (GDAL), OGR Simple Features Library, PostGIS, Summary of Applications

Unit 3 **(15)**

Installing MapServer - How MapServer Applications Operate, Walkthrough of the Main Components, Installing MapServer, Getting Help; Acquiring Map Data - Appraising Your Data Needs, Acquiring the Data, Analyzing Map Data - Downloading the Demonstration Data, Installing Data Management Tools: GDAL and FWTools, Examining Data Content, Summarizing Information Using Other Tools; Converting Map Data - Converting Vector Data, Converting Raster Data to Other Formats; Visualizing Mapping Data in a Desktop Program - Visualization and Mapping Programs

Unit 4 **(5)**

Using OpenEV, OpenEV Basics; Create and Edit Personal Map Data Planning Your Map, Preprocessing Data Examples; Creating Static Maps MapServer Utilities - Sample Uses of the Command-Line Utilities, Setting Output Image Formats; Publishing Interactive Maps on the Web - Preparing and Testing MapServer, Create a Custom Application for a Particular Area

Books and References:

1. Tyler Mitchell, 2005. Web Mapping Illustrated Using Open Source GIS Toolkits; O'Reilly Media

2. Zhong-ren Peng and Ming-hsiang Tsou, 2003. Internet GIS: Distributed Geographic Information Services for the Internet and Wireless Networks, Wiley (ISBN: 0471359238)
3. http://www.webgisdev.com/home.htm
4. Berners-Lee, Tim. "Style Guide for Online Hypertext." 1995. http://www.w3.org/pub/WWW/Provider/Style/All.html
5. Katz, Sol. "Metadata and WWW Mapping Home Page." 1997. http://www.blm.gov/gis/nsdi.html
6. Langaas, Sindre. "Commercial, off-the-shelf solutions for GIS-WWW interfacing."1996. http://www.grida.no/prog/norbal/docs/giswww/giswww.htm
7. Morris, Steve. "Web GIS and Interactive Mapping Sites." 1997. http://sunsite.berkeley.edu/GIS/intergis.html
8. Brandon Plewe, 1997. GIS Online: Information Retrieval, Mapping, and the Internet, OnWord Press (ISBN-10: 1566901375)

Annexure-XXIV-B of Agenda Item no. 6.23

M.Tech.

in

Computer Science and Engineering

with specialization in

Networking

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Computer Science and Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Computer Science and Engineering
School:	School of Engineering and Technology
Name of the Course:	M.Tech. in Computer Science and Engineering with specialization in Networking
Duration:	Two years
Total number of Credits:	66
Date of Meeting of BOS:	July 12, 2012
Status	Approved by BOS
Members of BOS:	1. Prof. Abhishek Swaroop, HOD Chairman 2. Mr. Jitesh Khatri, LGE, Noida Ext. Member 3. Dr. Ravi Rastogi, Assoc. Professsor Int. Member 4. Mr. T. P. Singh, Asstt. Professor Int. Member 5. Mr. Ashok Sahoo, Assoc. Professor Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by BOS and Faculty Board

COURSE STRUCTURE

M. Tech. in Computer Science and Engineering with specialization in Networking

SEMESTER	Courses (L-T-P) Credits							L. Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Mathematical & Statistical Techniques in Computer Science (3-1-0) 4	Analysis & Design of Algorithms (3-1-0) 4	Advanced Computer Architecture (3-0-0) 3	Departmental Elective-1 (3-0-0) 3	Advanced Computer Network (3-0-0)3	Foriegn Language (1-0-2)2	ADA lab (0-0-2) 1 Adv. Computer Network Lab (0-0-2) 1	**6**	**16**	**2**	**6**	**24**	**21**
II	Advanced Operating System (3-0-0) 3	Advanced Database Management Systems (3-0-0)3	Departmental Elective-2 (3-0-0) 3	Departmental Elective-3 (3-0-0) 3	Open Elective (3-0-0) 3	Adv. OS lab (0-0-2) 1 ADBMS lab (0-0-2) 1	Technical Communication (1-0-2)2	**6**	**16**	**0**	**6**	**22**	**19**
III	Seminar (0-0-2)2	Project (0-0-4) 4	Dissertation (0-0-15) 8					**0**	**0**	**0**	**21**	**21**	**14**
IV	Dissertation (0-0-21) 12							**0**	**0**	**0**	**21**	**21**	**12**

Total Credits- 66

LIST OF DEPARTMENTAL ELECTIVES

1. Data mining & Warehousing.
2. Pattern Recognition
3. Advanced Network Security
4. Advanced Wireless Communication
5. Advanced Mobile computing
6. Recent Advances in Computer Networks
7. Internet Security and Cyber Law
8. Grid Computing

LIST OF OPEN ELECTIVES

1. Modeling and Simulation
2. Soft Computing

M.Tech.

in

Computer Science and Engineering

with specialization in

Networking

SYLLABI

MCS 113: Analysis & Design of Algorithms

L T P: 3-1-0 **Credit: 4**

UNIT 1: Introduction **(8)**

Algorithm design paradigms- motivation, Concept of algorithmic efficiency, Run time analysis of algorithms, Growth of Functions, Asymptotic Notations, Recurrences: Master's Method, Iteration Method & Recursion Trees, Theory of NP-Completeness: Introduction to Class-P, NP, NP- Hard & NP-Complete with examples, Polynomial Reduction.

UNIT 2: Divide and Conquer **(8)**

Structure & Analysis of divide-and-conquer algorithms: examples-Binary search, Quick sort, Merge sort, Medians and Order Statistics, i^{th} order statistics, Randomized Algorithms.

UNIT 3: Dynamic Programming **(8)**

Overview, Difference between dynamic programming and divide and conquer, Applications and analysis: Matrix Chain Multiplication, 0/1 Knapsack Problem, All-pairs Shortest path in graphs, Longest Common sub-sequence.

UNIT 4: Greedy Method **(8)**

Overview of the Greedy paradigm, Fractional Knapsack problem, Minimum spanning Trees, Single source shortest paths, Task Scheduling Problem. Backtracking: Introduction, N-Queens problem.

UNIT 5: Approximation Algorithms **(8)**

Overview, Performance Bounds, Approximate Vertex Cover, Approximate TSP Tour, Specific Algorithms: Pattern Matching Algorithms: Rabin Karp Algorithm, KMP Algorithm, Euclid's algorithm, Huffman Coding Algorithm, Computation of FFT.

Text Books:

1. Cormen et al., "Introduction of Computer Algorithm", Prentice Hall India.

Reference Books:

1. Sahni et al., "Fundamentals of Computer Algorithms", Galgotia Publication.

MCS 115: Advanced Computer Networks

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Introduction, overview of network building blocks, Concept of Layered Architecture, OSI & TCP/IP Models, Characteristics of Peer to Peer, Server based, Broadcast & Point to Point networks. Packet switching, Datagram & Virtual Circuit network, Hubs, bridges, switches, Routers & Gateways.

UNIT 2: Data Link Layer Protocols **(8)**

LLC and MAC sub layer protocol, ARQ based error control, Data Link Protocols: HDLC, SLIP, PPP, CSMA/CD & CSMA/CA, 802.11 Wireless LAN, 802.15 and 802.16.

UNIT 3: Internetworking **(8)**

Tunneling, Fragmentation, IP addressing (IPV4 & IPV6), Subnetting, CIDR, DHCP, Internet protocols: IP, ICMP, ARP, RARP, RIP, OSPF, EGP & BGP.

UNIT 4: Transport Layer Protocols **(8)**

TCP/IP suite: TCP, UDP, and SCTP. Introduction to SONET/SDH, X.25, Frame Relay and ATM Networks.

UNIT 5: Wireless WANs **(8)**

Cellular Telephony – Frequency Reuse principle, Transmitting, Receiving, Roaming, First Generation, Second Generation, Third Generation, Satellite Networks – GEO Satellites, LEO Satellites & MEO Satellites.

Text Books:

1. Forouzen, "Data Communication and Networking", TMH (Fourth edition).

Reference Books:

1. A.S. Tanenbaum, “Computer Networks”, Pearson Education (Fourth edition).
2. W. Stallings, “Data and Computer Communication”, Macmillan Press.

MCS 102: Advanced Database Management System

L T P: 3-0-0 **Credit: 3**

UNIT 1: Overview of DBMS (8)

Introduction, ER-Modeling, SQL-99, Transaction Processing, Concurrency control, failure recovery; Introduction to distributed data base management systems, Distributed Transaction Modeling and concurrency Control, Distributed Deadlock, Commit Protocols.

UNIT 2: Database Models (8)

Semantic Database Models and Systems, Object-Oriented Database Systems, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Relational Extensions: Design Techniques, Extension Techniques Object / Relational Systems: Open ODB, Interface. Object Relational Databases.

UNIT 3: Deductive Databases (8)

Introduction, Prolog/Datalog, Horn Clauses, Rules interpretation – Proof-theoretic and model-theoretic Evaluation of Datalog program, Recursive queries with negation.

UNIT 4: Web Database Programming (8)

Data types, PHP features and Programming, Collecting data from Forms and insertion, Retrieval queries from Database Tables. XML : Extensible Markup Language data model, XMP documents, DTD, Schema, Extracting XML documents from Relational databases.

UNIT 5: Emerging Database Technologies

(8) Mobile databases, Multimedia databases, Geographical Information Systems, Genome Data Management.

Text Books:

1. Silberschatz, Korth and Sudarshan , “Database System Concepts”, McGraw Hill.
2. Elmasri and Navathe, “Fundamentals of Database Systems”, Pearson.

Reference Books:

1. C S R Prabhu,”Object Oriented Data Base Systems, approaches and architectures”, PHI.
2. Ceri, Pelagatti, “Distributed Databases Principles & Systems”, McGraw Hill.
3. Hansen & Hansen, “Database Management and Design”, PHI.
4. Shah, “Database Systems using Oracle:A simplified guide to SQL and PL/SQL”, PHI.
5. N. Goodman, V. Hadzilacos "Concurrency Control and Recovery in Data Base System" Addison Wesley.

MCS 002: Data Mining & Warehousing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

What is data mining, Challenges, Other issues, Data Quality, Data preprocessing, Data reduction, Data mining functionalities, Data mining primitives, data mining query language, Architectures of data mining system, Generalization, Summarization and Characterization.

UNIT 2: Association Analysis **(8)**

Problem Definition, frequent item set generation, Rule generation, Challenges, Interesting measures, Generalization of association patterns (Apriori, fptree algo, etc.).

UNIT 3: Classification and Prediction **(8)**

Problem Definition, General Approach, Decision tree induction, Rule based classifiers, Cluster analysis: Introduction, Similarity and Distance, Characteristics of clustering algorithms (like partitioning, Hierarchical clustering), Cluster evaluation.

UNIT 4: Data Warehouse **(8)**

Concept & usage of data warehouse; data warehouse architecture, data warehouse implementation, data warehouse utilities; data marts, metadata, data summarization & multidimensional data models, data cubes, data warehouse schema - stars, snowflake, aggregate tables and fact constellations, applications of data warehouse.

UNIT 5: Building a Data Warehouse **(8)**

Main issues: data preparation, data mining tools , data security, data backup & recovery; data warehouse testing & tuning; trends in data warehousing; data warehouse pitfalls & problems.

Text Books:

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kauf Mann

Reference Books:

1. Alex Berson, “Data Warehousing, Data Mining and OLTP”, MGH.
2. W.H. Inman, “Building the Data Warehouse”, John Wiley & Sons.
3. M.H. Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson Education

MCS 006: Grid computing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Definition of Grid, history and evolution of Grid Computing, Virtual Organizations, Computational Grid projects around the world, Grid challenges, Grid organizations, Service Oriented Architecture (SOA), Issues in Management of Grid Models.

UNIT 2: Architecture **(8)**

Components of Layered Grid Architecture, Open Grid Services Architecture (OGSA), Grid architecture models, Grid Resource Information Service (GRIS). Resource infrastructure.

UNIT 3: Grid Middleware **(8)**

Globus: Overview, resource specification language, information services, Globus Resource Allocation Manager (GRAM), Grid FTP protocol.

UNIT 4: Resource Management and Scheduling **(8)**

Grid Scheduling and Resource Management, Scheduling Paradigms, Working principles of Scheduling, A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT 5: Grid Portals and Security **(8)**

Functionality and underlying infrastructure for sample general and application specific portals; Grid security demands and solutions. **Case Studies**: Recent version of Globus Toolkit-Architecture, Components and Features.

Text Books:

1. Foster, I. and Kesselman, C. (eds.). The Grid: Blueprint for a New Computing Infrastructure. Morgan Kaufmann Publishers, (1999).

Reference Books:

1. Luis Ferreira et al., Grid Computing in Research and Education, ibm.com/redbooks, (September 203).
2. Maozhen Li, Mark Baker, “The Grid Core Technologies”, John Wiley & Sons, (2005).

MCS 112: Mathematical & Statistical Techniques in Computer Science

L T P: 3-1-0 **Credit: 4**

UNIT 1: Introduction, Computational Errors and their Analysis (8)
(Accuracy of numbers, Errors and a general error formula, Errors in Numerical Computations and Inverse Problems**,** Floating Point Representations of Numbers and operations**,** Errors in a Series Approximation**). Algebraic & Transcendental Equations** (Order of convergence of iterative and bisection methods, Convergence of a Sequence, Iterative methods for system of non-linear equations, Regular falsi method, Secant method, Newton-Ralphson Method).

UNIT 2: Algorithmic Optimization (8)
(Assumptions for interpolation, errors in polynomial interpolation, finite differences, difference operators and their relationship**,** Newton's , Gauss's, Stirling's & Laplace-Everett's formula for interpolation**,** Interpolation by unevenly spaced points: Lagrange's interpolation formula**). Numerical Integration, Differentiation & Ordinary Differential Equations** (Introduction to numerical differentiation, Introduction to numerical integration, Trapezoidal and Simpson's rules, Introduction to numerical solution of ordinary differential equations, Euler's method , Runge-Kutta methods).

UNIT 3: Vector Calculus (8)
(Scalar functions of several variables, Partial derivatives and differentiability, gradient vector, vector fields) **Linear Systems, Orthogonality, Eigen values & Eigen vectors (**Vector spaces, Linear maps, Systems of linear equations, Orthogonality, orthogonal projections**,** Eigen values & Eigen vectors**,** QR & Singular value decomposition).

UNIT 4: Spectral Methods (8)
(Trigonometric approximation and interpolation, Trigonometric methods for differential equations**), Time Series Analysis (**Introduction to classical methods)**, Fourier and Wavelet Analysis (**Introduction to Fourier and wavelet transform and their applications in knowledge discovery & exploratory data analysis).

UNIT 5: Statistical Method (8)
(Curve fitting: Principle of least squares (Fitting of $y=ae^{bx}$, $y=ax^{b}$, $y=ab^{x}$, $pv^{r}=k$, $xy=b+ax$, $y=ax+bx^{2}$))**,** Regression analysis**,** Techniques for statistical quality control, Testing of hypothesis.

Text Books:

1. Matheus Grasselli and Dimitry Pelinovsky, "Numerical Mathematics", Jones and Bartlet Publishers, USA.
2. M. Goyal, "Computer Based Numerical & Statistical Techniques", Infinity Science Press LLC, MA, USA.

Reference Books:

1. Lars Elden, "Mattrix Methods in Data Mining and Pattern Recognition", SIAM (Society for Industrial and Applied Mathematics), USA.

MCS 116: Pattern Recognition

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Introduction to pattern recognition systems and their design cycle, learning and adaptation. Bayes Decision theory- introduction, continuous case, 2-category classification, minimum error rate classification, classifiers, discriminant functions, and decision surfaces. Error probabilities and integrals, normal density**,** discriminant functions for normal density, Bayes Decision theory discrete case.

UNIT 2: Estimation **(8)**

Parameter estimation and supervised learning- Maximum likelihood estimation, the Bayes classifier, learning the mean of a normal density, general bayesian learning. Nonparametric technique- density estimation, parzen windows, k-nearest Neighbor estimation, estimation of posterior probabilities, k_n nearest neighbor rule, The nearest- neighbor rule, k-nearest neighbor rule.

UNIT 3:Linear Discriminant Functions **(8)**

Linear discriminant functions- linear discriminant functions and decision surfaces, generalized linear discriminant functions, The 2-category linearly separable case, non-separable behavior, linear programming procedures.

UNIT 4: Unsupervised Learning and Clustering **(8)**

Unsupervised learning and Clustering: Mixture Densities and Identifiability, Maximum-Likelihood Estimates, Application to normal mixtures, Unsupervised Bayesian learning, Data Description and Clustering, Hierarchical Clustering.

UNIT 5: Applications and Case Studies **(8)**

Applications of Pattern Recognition to the areas of Data Security, Defense and Medical, Case Studies on defense and medical fields.

Text Books:

1. Duda and Hart P.E, “Pattern classification and scene analysis”, John Wiley and sons, NY.

Reference Books:

1. Earl Gose, Richard Johnsonbaugh, and Steve Jost, “Pattern Recognition and Image Analysis”, PHI Pvt. Ltd., NewDelhi.
2. Fu, K.S., Eaglewood cliffs, “Syntactic Pattern recognition and applications”, Prentice Hall, N.J.
3. Rochard O. Duda, Hart, P.E, and David G Stork, “Pattern classification”, John Wiley & Sons Inc.

MCS 103: Advanced Computer Architecture

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction (8)

Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn's & Feng's Classification Performance Metrics and Measures, IEEE POSIX Threads, Thread Synchronization. Pipelining and Memory Hierarchy, Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP.

UNIT 2: Cache Memory (8)

Basic cache structure, Set associative caches, Evaluating Cache performances Determining Cache parameters, Replacement Policies, Implementing LRU, Replacement policies; Virtual Memory : Basic virtual memory structure, Translation lookaside buffer, Segment tables, Replacement algorithms, Detail example of a virtual memory system.

UNIT 3: Pipeline Techniques (8)

Principles of Pipelined computers, Evaluating performance of pipelined, Computers, Reservation tables and collision vectors, Maximizing pipeline, Performance, Conditional branches in pipelined computers, Internal forwarding and deferred instructions.

UNIT 4: Multiprocessors (8)

Flynn's classification of multiprocessors, Vector computers, Numerical algorithms on a vector computer, Pipelining in vector computers, Examples of vector computers, e.g. Cray, Multiprocessor interconnections : General purpose multiprocessors, e.g. RP-1, HEP, Data flow computers.

UNIT 5: RISC Computers (8)

Pipelined structure of the CPU, RISC characteristics. Case study of MIPS-64 processor

Text Books:

1. M. R. Bhujade, "Parallel Computing", Newage International Pvt. Ltd.
2. Stallings, William, "Computer organization and architecture, designing for performance", Prentice Hall of India.

Reference Books:

1. J. L. Hennessy and D. A. Patterson, "Computer architecture: a quantitative approach", Harcourt Asia, Singapore.
2. Kain, "Advanced Computer Architecture: a system Design approach", PHI.

MCS 003: Advanced Mobile Computing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Basic Concepts, Principle of Cellular Communication, overview of 1G, 2G, 2.3G, 3G and 4G, GSM and CDMA architecture. Mobile Agent: Mobile Objects and Agents, Mobile program, Mobile Agent issues.

UNIT 2: Routing in Base Station Subsystem **(8)**

Directory look up, mail box, routing data to mobile, routing table update, permanent and temporary address schemes, home domain directory, location directory. Routing: TCP/IP and other protocols, Ad-hoc networking protocols, Mobile Ipv4 and Ipv6, Mobile Internetworking Architecture, Internet Mobility issues, Route optimization, Wireless TCP, GPRS services, IP over CDMA.

UNIT 3: Channel Allocation **(8)**

Basic Strategies, congestion control, Static and Dynamic routing, concept of Channel Borrowing. Wireless ATM: Channel borrowing.

UNIT 4: Mobile Computing **(8)**

Database requirements, computing within a building, within a city and outside city. Mobility: Mobility Management, Mobile Devices: PDA, Mobile OS.

UNIT 5: Proxy Servers and Applications **(8)**

Wireless Internet, remote data access, Global Positioning, Document Tracing, Health Care, Warehouse, Automated Vending. Future directions in mobile networks: A survey of recent work from publications including some case studies on Ad hoc networks.

Text Books:

1. Richard Wheeler, “Mobility: processes, computers and Agents”, Pearson
2. Charles Perkins, “Mobile IP: Design principle and practices”, Pearson
3. Charles Perkins, “Ad hoc Networks”, Addison Wesley**.**

Reference Books:

1. Stojmenovic and Cacute, “Handbook of Wireless Networks and Mobile Computing”, Wiley, 2002, ISBN 0471419028.
2. Jochen Schiller,“Mobile Communications”,Addison-Wesley,Second edition, 2004.

MCS 001: Advanced Network Security

L T P: 3-0-0 **Credit: 3**

UNIT 1: Basic Concept of Network Security (8)

Network Security Model, OSI Security Architecture, Goals of network security and standards, Basic concepts of cryptography, Introduction to IT-Security in Open system, threats to security, security requirements and how it works.

UNIT 2: Network Security Threats and Issues (8)

Protocol Vulnerabilities: DoS and DDoS, SYN Flooding, Session Hijacking, ARP Spoofing, Attack on DNS, Wireless LAN: Frame spoofing, Violating MAC; Software Vulnerabilities: Phishing Attack, Buffer Overflow, Cross-site Scripting, SQL Injection; Virus, Worm, Malware, Botnets; Eavesdropping, Password Snooping and IP Masquerade.

UNIT 3: Security at Network Level (8)

Authentication: password-based, certificate-based, Centralized; Kerbos, Biometrics. IP Security, IKE, Virtual Private Network, SSL, OpenSSL, Wireless LAN Security: WEP, TKIP, CCMP.

UNIT 4: Firewall Introduction to ACL (8)

Introduction to Firewall, Firewall Functionalities, Types of Firewalls, Packet Filtering, Reverse Proxy, Stateful Firewalls, limitation of Stateful FireWalls, Application Firewalls, Circuit Firewalls, CHECK Point, CISCO PIX, CISCO firewalls case study.

UNIT 5: Security and Network Applications (8)

Electronic Payment: Payment types, SET, Chip Card Transaction, Mobile Payments; Electronic Mail Security, Web Security: SSL and TLS; Web Service Security: Token Type, XML Encryption, XML Signatures, SAML; Intrusion detection and prevention systems; honey pots.

Text Book:

1. Bernard Menezes, “Network Security and Cryptography”, Cengage Learning.

Reference Books:

1. Raymond R. Panko,“Corporate Computer and Network Security”, Pearson Education.
2. Willam Stallings, “Cryptography and Network Security”, Pearson Education.
3. J. Miichael Stewart,“Network Security. Firewalls, and VPNs” Jones & Bartlett Learning.
4. Kevin Lam, David LeBlanc, Ben Smith, “Assessing Network Security”, Microsoft Press.

MCS 101: Advanced Operating System

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Operating system concepts, architecture, Function, process management, Process Deadlocks: Introduction, Models of Deadlocks & Resources. Synchronization Process: Critical section, Dinning Philosopher problem, Producer-Consumer problem, Reader-Writer problem.

UNIT 2: Distributed Operating System **(8)**

Architectures of Distributed Systems: Introduction, Issues of distributed Systems, Resource sharing and the Web Challenges. Theoretical Foundation for Distributed System: Limitation of Distributed system, absence of global clock, shared memory, Logical clocks; Lamport's & vectors logical clocks, Causal ordering of messages.

UNIT 3: Distributed Mutual Exclusion **(8)**

Classification of distributed mutual exclusion, requirement of mutual exclusion, Token based and non token based algorithms, performance metric for distributed mutual exclusion algorithms.

UNIT 4: Distributed Deadlock Detection **(8)**

System model, resource vs. communication deadlocks, deadlock prevention, avoidance, detection & resolution, centralized dead lock detection, distributed dead lock detection, path pushing algorithms, edge chasing algorithms.

UNIT 5: Security & Case Study **(8)**

Protection and Security-Goals of protection, Domain of protection, Access matrix, Implementation of access Matrix, Safety in the access matrix model, advanced models of protection. Recent Trends & Applications**:** Case Studies: LINUX, WINDOWS 2000, WINDOWS XP.

Text Book:

1. Singhal & Shivaratri, "Advanced Concepts in Operating Systems", McGraw Hill.

Reference Books:

1. Tanenbaum, "Modern Operating Systems" (Third Edition), PHI.
2. P K Sinha, "Distributed Operating Systems, Concepts & Design", EEE.
3. Silberschatz & Galvin, "Operating System Concepts", Jhon Wiley & sons(Asia) Pvt. Ltd.

MCS 003: Advanced Wireless Communication

L T P: 3-0-0 **Credit: 3**

UNIT 1: Radio Propagation Over Wireless Channel (8)

Mobile radio communication fundamentals, fundamental of wireless communication, bandwidth concept, type of signals, quantization, channel coding, equalization, large scale path loss: propagation models, reflection, diffraction and scattering. Small scale multi path propagation, multi path effect/ fading in land mobile system.

UNIT 2: Wideband Modulation Techniques (8)

Spread spectrum modulation techniques: Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum (FH-SS), OFDM (Multi carrier Modulation), Introduction to multiple Access: time division multiple access (TDMA), space division multiple access (SDMA), code division multiple access (CDMA) and frequency division multiple access (FDMA).

UNIT 3: Broadcast Networks (8)

Introduction to Broadcast Systems, DAB, Digital Radio Mondiale (DRM), HD Radio Technology, Digital Video broadcasting (DVB), Direct to home (DTH).

UNIT 4:Infrastructure-Based/Cellular Networks (8)

Introduction to Mobile Networks, GSM System, GPRS, EDGE, and CDMA based standard, IMT-2000, WLL, Mobile Satellite Communication, 3G and 4G, Cognitive Radio Network (5G).

UNIT 5: Ad Hoc Network, Wlan and WMAN (8)

Introduction, Bluetooth, Wi-Fi Standard, WiMAX Standard, Wireless Sensor Networks, IEEE 802.15.4 and Zigbee, Ultra-wideband(UWB), IEEE 802.20.

Text Book:

1.Upena Dalal, “Wireless Communication”, Oxford Higher Education.

Reference Books:

1. Willium C. Y. Lee, “Mobile communication Design and fundamentals”
2. D. R. Kamilo Fehar, “Wireless digital communication”
3. Haykin,S and Moher,M., “Modern wireless communication”, Pearson.
4.T.S. Rappaport, “Wireless Communication-Principles and practice”, Pearson.

MCS 004: Recent Advances in Computer Networks

L T P: 3-0-0 **Credit: 3**

UNIT 1: Distributed Computing (8)

Introduction to Distributed Systems, Distributed Parallel Computing Systems, Technologies for Network-based Computing, Performance, Security, and Energy-Efficiency, Virtualization for Distributed Computing: Basics of Virtual Machines, Virtualization Techniques at Various Levels, Single-Host and Desktop Virtualization, Multiple-Host Virtualization, Performance Measurement for Virtual Machine.

UNIT 2: Grid Computing (8)

Introduction to Grid Computing, Grid Computing and Resource Management: Grid Architecture and Management, Grid Resource Management Middleware, Grid Security Infrastructure, Workload and Performance Prediction.

UNIT 3: Cloud Computing (8)

Introduction, Cloud Computing and Service Models, Architectural Design of Computing Clouds, Cloud Platforms and Service Models, Resource Management and Research Challenges, Cloud Security and Trust Management.

UNIT 4: Peer-to-Peer Computing (8)

Peer-to-Peer Computing Systems, P2P Overlay Networks and Properties, Routing, Locality, and Hashing, Fault-Tolerance and Failure Recovery, P2P File Sharing and Content Delivery, Clustered Systems: Design Objectives of Clusters and MPPs, Cluster and MPP System Architectures, Design Principles of Clustered Systems.

UNIT 5: Wireless Sensor Networks (8)

Overview of Wireless Sensor Networks, Challenges for Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks, Architecture: Single-Node Architecture, Network Architecture Optimization Goals and Figures of Merit, Gateway Concepts, Topology Control, Clustering, Time Synchronization, Localization and Positioning.

Text Books:

1. Kai Hwang, Jack Dongarra and Geoffrey C. Fox, “Distributed and Cloud Computing”, Morgan Kaufmann Publishers.
2. Holger Karl and Andreas Willig, “Protocols And Architectures for Wireless Sensor Networks", John Wiley.

Reference Books:

1. R. Buyya et al., “Cloud Computing: Principles and Paradigms”, Wiley.
2. Feng Zhao and Leonidas J. Guibas, “Wireless Sensor Networks - An Information Processing Approach", Elsevier.

MCS 005: Internet Security and Cyber Law

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Introduction to cyber crime, internet and security concepts, basics of cyber crime and criminals. Various cyber crime types, cost of information security.

UNIT 2: Different Cyber Crimes **(8)**

Hacking, spam, DOS attack, phishing, identity theft, break-ins, credit card frauds, software piracy, industrial espionage etc.

UNIT 3: Theoretical and Social Perspective on Cybercrime **(8)**

Introduction, Theories, Classical Criminology, Trait Theories, Social Process Theories, Social Structure Theories, Conflict Theories, Integrated Theories, The Social and Economic Impacts of Cybercrime, Emerging Crime, Related Issues and Controversies.

UNIT 4: Security in Digital World **(8)**

Cryptography, digital signatures, need and significance of digital signatures, methods of employing digital signatures, effects of digital signatures, future developments, digital certificates.

UNIT 5 : Case Studies **(8)**

Case Studies: Case studies of few frauds and cyber crimes in history.

Text Books:

1. Vakul Sharma, "Handbook of Cyber Law": Macmillan Publishers India (2002).
2. Dr Majid Yar, "Cybercrime and Society": Sage Publications Ltd , 2006.

Reference Books:

1. Vakul Sharma, "Information Technology Law & Practice Cyber Law & E Commerce", Universal Law Publishing Co Pvt Ltd (2011)
2. C.Sam McQuade**,** "Understanding and Managing Cybercrime", Prentice Hall, 2006.

OEM 001: Modeling and Simulation

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

The Modeling Process: Statistics of Simulation and Monte-Carlo Simulation, Estimating π and log(x) using a dartboard, Model Analysis, Validation and Verification, Terminology & Components, Discrete vs. Continuous time, Process flow in simulation study, Simulation Examples, Queuing systems, Communications networks, General Principles: Event -driven simulation, World Views, List processing, Human-System Integration and Training Applications, Current and Future Directions of Simulation for Complex Systems.

UNIT 2: Mathematical Background **(8)**

Random Number Generation: Properties of Random Numbers, Generation of Pseudo-Random Numbers, Uniform pseudo-RNGs: properties, Testing for Randomness, Pitfalls, Random Variate Generation: Inverse Transform, Direct Transform, Convolution, Accept-Reject, use of random numbers in different applications.

UNIT 3: Queuing Models **(8)**

Characteristics of queuing systems, queuing notations, long run measures of performance of queuing systems, Steady state behaviour of Markovian models (M/G/1, M/M/1, M/M/c) overview of finite capacity and finite calling population models, Network of Queues.

UNIT 4: Simulation Process **(8)**

Statistical models:- Terminology and Concepts, Useful Statistical Models, Distributions, Queuing models:- Characteristics, Performance Measures, Steady-State Behaviour, Networks of Queues, Input Modeling:- Collecting Data, Identifying Distribution, Histograms, Parameter Estimation, Goodness-of-Fit, Selecting Input Model without Data, Output Analysis:- Types of Simulations with Respect to Output Analysis, Stochastic Nature of Output Data, Measures of Performance, Output Analysis for Termination Simulations, Output Analysis for Steady-State Simulations

UNIT 5: Simulation Software and Case Study **(8)**

History, Selection process, interpreted vs. compiled simulators, Future trends, Simulation in High Level Languages, Simulation packages, Simulation environment in Simulink and Matlab. Case Studies: Simulation of manufacturing systems, Simulation of Material Handling system, Simulation of computer systems, Simulation of super market, Cobweb model, and any service sectors.

Text Books:

1. Banks J., Carson J. S., Nelson B. L., and Nicol D. M., “Discrete Event System Simulation”, 3rd edition, Pearson Education, 2001.
2. Law M, Kelton W, “Simulation Modeling and Analysis” McGraw-Hill, New York, NY, 2000

Reference Books:

1. Hoel, Port, and Stone, “Introduction to Stochastic Processes”, Houghton Mifflin.
2. Gilks, Richardson and Spiegelhalter, “Markov Chain Monte Carlo Methods in Practice”, Chapman and Hall.
3. Law M, Kelton W, “Simulation Modeling and Analysis”, McGraw-Hill, New York, NY, 2000
4. Madachy R., “ Software Process Dynamics”, Wiley/IEEE Press, 2007

MCS 107: Soft Computing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Neural Networks (8)

History, overview of biological Neuro-system, Mathematical Models of Neurons, architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

UNIT 2 : Fuzzy Logic (8)

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

UNIT 3: Fuzzy Arithmetic (8)

Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy Logic: Classical Logic, Multi-valued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges.

UNIT 4: Uncertainty Based Information (8)

Information & Uncertainty, Non-specificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets. Introduction of Neuro-Fuzzy Systems.

UNIT 5: Architecture of Neuro Fuzzy Networks (8)

Application of Fuzzy Logic: Medicine, Economics etc. Genetic Algorithm: An Overview, GA in problem solving, Implementation of GA.

Text Books:

1. S.N.Sivanandam, “Principles of Soft Computing”, John Wiley-India edition.
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, PHI.

Reference Books:

1. Anderson J.A., “An Introduction to Neural Networks”, PHI.
2. G.J. Klir and B. Yuan “Fuzzy Sets & Fuzzy Logic”, PHI.
3. Melanie Mitchell “An Introduction to Genetic Algorithms”, PHI.

Annexure-XXIV-B of Agenda Item no. 6.23

M.Tech.

in

Computer Science and Engineering

with specialization in

Software Engineering

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Computer Science & Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Computer Science and Engineering
School:	School of Engineering and Technology
Name of the Course:	M. Tech. in Computer Science and Engineering with Specialization in Software Engineering
Duration:	Two Years
Total number of Credits:	66
Date of Meeting of BOS:	July 12, 2012
Status:	Approved by BOS
Members of BOS:	1. Prof. Abhishek Swaroop, HOD Chairman 2. Mr. Jitesh Khatri, LGE, Noida Ext. Member 3. Dr. Ravi Rastogi, Assoc. Prof. Int. Member 4. Mr. T. P. Singh, Coordinator Int. Member 5. Mr. Ashok Sahoo, Assoc. Prof. Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by BOS and Faculty Board

COURSE STRUCTURE

M. Tech. in Computer Science and Engineering with specialization in Software Engineering

SEMESTER	Courses (L-T-P) Credits							L. Courses	Contact Hr/Week L	T	P	Total	Credits
I	Mathematical & Statistical Techniques in Computer Science (3-1-0) 4	Analysis & Design of Algorithms (3-1-0) 4	Objected Oriented Software Engineering (3-0-0) 3	Departmental Elective-1 (3-0-0) 3	Advanced Computer Network (3-0-0)3	Foreign Language (1-0-2)2	ADA lab (0-0-2) 1 Software Engg. Lab (0-0-2) 1	6	16	2	6	24	21
II	Software Architecture & Design Patterns (3-0-0) 3	Advanced Database Management Systems (3-0-0)3	Departmental Elective-2 (3-0-0) 3	Departmental Elective-3 (3-0-0) 3	Open Elective (3-0-0) 3	SADP lab (0-0-2) 1 ADBMS lab (0-0-2) 1	Technical Communication (1-0-2)2	6	16	0	6	22	19
III	Seminar (0-0-2)2	Project (0-0-4) 4	Dissertation (0-0-15) 8					0	0	0	21	21	14
IV	Dissertation (0-0-21) 12							0	0	0	21	21	12

Total Credits- 66

LIST OF DEPARTMENTAL ELECTIVES

1. Data mining & Warehousing.
2. Soft Computing Techniques
3. Pattern Recognition
4. Software Project Management
5. Object Oriented Modelling & Design
6. Software Quality Metrics & Testing
7. Recent Advances in Software Engineering
8. Formal Methods in Software Engineering
9. Grid Computing

LIST OF OPEN ELECTIVES

1. Modeling and Simulation
2. Soft Computing

M.Tech.

in

Computer Science and Engineering

with specialization in

Software Engineering

SYLLABI

MCS 113: Analysis & Design of Algorithms

L T P: 3-1-0 **Credit: 4**

UNIT 1: Introduction **(8)**

Algorithm design paradigms- motivation, Concept of algorithmic efficiency, Run time analysis of algorithms, Growth of Functions, Asymptotic Notations, Recurrences: Master's Method, Iteration Method & Recursion Trees. Theory of NP-Completeness: Introduction to Class-P, NP, NP- Hard & NP-Complete with examples, Polynomial Reduction.

UNIT 2: Divide and Conquer **(8)**

Structure & Analysis of divide-and-conquer algorithms: examples-Binary search, Quick sort, Merge sort, Medians and Order Statistics, i^{th} order statistics, Randomized Algorithms.

UNIT 3: Dynamic Programming **(8)**

Overview, Difference between dynamic programming and divide and conquer, Applications and analysis: Matrix Chain Multiplication, 0/1 Knapsack Problem, All-pairs Shortest path in graphs, Longest Common sub-sequence.

UNIT 4: Greedy Method **(8)**

Overview of the Greedy paradigm, Fractional Knapsack problem, Minimum spanning Trees, Single source shortest paths, Task Scheduling Problem. Backtracking: Introduction, N-Queens problem.

UNIT 5: Approximation Algorithms **(8)**

Overview, Performance Bounds, Approximate Vertex Cover, Approximate TSP Tour. Specific Algorithms: Pattern Matching Algorithms: Rabin Karp Algorithm, KMP Algorithm, Euclid's algorithm, Huffman Coding Algorithm, Computation of FFT.

Text Books:

1. Cormen et al, "Introduction of Computer Algorithm", Prentice Hall India.

Reference Books:

1. Sahni et al, "Fundamentals of Computer Algorithms", Galgotia Publication.

MCS 115: Advanced Computer Networks

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Introduction, overview of network building blocks, Concept of Layered Architecture, OSI & TCP/IP Models, Characteristic of Peer to Peer, Server based, Broadcast & Point to Point networks. Packet switching, Datagram & Virtual Circuit network, Hubs, bridges, switches, Routers & Gateways.

UNIT 2: Data Link Layer Protocols **(8)**

LLC and MAC sub layer protocol, ARQ based error control, Data Link Protocols: HDLC, SLIP, PPP, CSMA/CD & CSMA/CA, 802.11 Wireless LAN, 802.15 and 802.16.

UNIT 3: Internetworking **(8)**

Tunneling, Fragmentation, IP addressing (IPV4 & IPV6), Subnetting, CIDR, DHCP, Internet protocols: IP, ICMP, ARP, RARP, RIP, OSPF, EGP & BGP.

UNIT 4: Transport Layer Protocols **(8)**

TCP/IP suite: TCP, UDP, and SCTP. Introduction to SONET/SDH, X.25, Frame Relay and ATM Networks.

UNIT 5: Wireless WANs **(8)**

Cellular Telephony – Frequency Reuse principle, Transmitting, Receiving, Roaming, First Generation, Second Generation, Third Generation, Satellite Networks – GEO Satellites, LEO Satellites & MEO Satellites.

Text Books:

1. Forouzen, "Data Communication and Networking", TMH (Fourth edition).

Reference Books:

1. A.S. Tanenbaum, “Computer Networks”, Pearson Education (Fourth edition).
2. W. Stallings, “Data and Computer Communication”, Macmillan Press.

MCS 102: Advanced Database Management System

L T P: 3-0-0 **Credit: 3**

UNIT 1: Overview of DBMS **(8)**

Introduction, ER-Modelling, SQL-99, Transaction Processing, Concurrency control, failure recovery; Introduction to distributed data base management systems, Distributed Transaction Modelling and concurrency Control, Distributed Deadlock, Commit Protocols.

UNIT 2: Database Models **(8)** Semantic Database Models and Systems, Object-Oriented Database Systems, Generalization, Aggregation and Association, Objects, Object Identity, Equality and Object Reference, Relational Extensions: Design Techniques, Extension Techniques Object / Relational Systems: Open ODB, Interface. Object Relational Databases.

UNIT 3: Deductive Databases **(8)**

Introduction, Prolog/Datalog, Horn Clauses, Rules interpretation – Proof-theoretic and model-theoretic Evaluation of Datalog program, Recursive queries with negation.

UNIT 4: Web Database Programming **(8)** Data types, PHP features and Programming, Collecting data from Forms and insertion, Retrieval queries from Database Tables, XML : Extensible Markup Language data model, XMP documents, DTD, Schema, Extracting XML documents from Relational databases.

UNIT 5: Emerging Database Technologies **(8)** Mobile databases, Multimedia databases, Geographical Information Systems, Genome Data Management.

Text Books:

1. Silberschatz, Korth and Sudarshan , “Database System Concepts” (Fifth Edition), McGraw Hill.
2. Elmasri and Navathe, “Fundamentals of Database Systems”, Pearson.

Reference Books:

1. C S R Prabhu,”Object Oriented Data Base Systems, approaches and architectures”, PHI.
2. Ceri, Pelagatti, “Distributed Databases Principles & Systems”, McGraw Hill.
3. Hansen & Hansen, “Database Management and Design” (Second Edition), PHI.
4. Shah, “Database Systems using Oracle:A simplified guide to SQL and PL/SQL” (Second Edition), PHI.
5. N. Goodman, V. Hadzilacos "Concurrency Control and Recovery in Data Base System" Addison Wesley.

MCS 002: Data Mining & Warehousing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

What is data mining, Challenges, Other issues, Data Quality, Data preprocessing, Data reduction, Data mining functionalities, Data mining primitives, data mining query language, Architectures of data mining system, Generalization, Summarization and Characterization.

UNIT 2: Association Analysis **(8)**

Problem Definition, frequent itemset generation, Rule generation, Challenges, Interestingness measures, Generalization of association patterns (Apriori, fptree algo, etc.).

UNIT 3: Classification and Prediction **(8)**

Problem Definition, General Approach, Decision tree induction, Rule based classifiers, Cluster analysis: Introduction, Similarity and Distance, Characteristics of clustering algorithms (like partitioning, Hierarchical clustering), Cluster evaluation.

UNIT 4: Data Warehouse **(8)**

Concept & usage of data warehouse; data warehouse architecture, data warehouse implementation, data warehouse utilities; data marts, metadata, data summarization & multidimensional data models, data cubes, data warehouse schema - stars, snowflake, aggregate tables and fact constellations, applications of data warehouse.

UNIT 5: Building a Data Warehouse **(8)**

Main issues: data preparation, data mining tools , data security, data backup & recovery; data warehouse testing & tuning; trends in data warehousing; data warehouse pitfalls & problems.

Text Books:

1. Jiawei Han and Micheline Kamber, “Data Mining: Concepts and Techniques”, Morgan Kuntmann.

Reference Books:

1. Alex Berson, “Data Warehousing, Data Mining and OLTP”, MGH.
2. W.H. Inman, “Building the Data Warehouse”, John Wiley & Sons.
3. M.H. Dunham, “Data Mining: Introductory and Advanced Topics”, Perason Education

MCS 006: Grid Computing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Definition of Grid, history and evolution of Grid Computing, Virtual Organizations, Computational Grid projects around the world, Grid challenges, Grid organizations, Service Oriented Architecture (SOA), Issues in Management of Grid Models.

UNIT 2: Architecture **(8)**

Components of Layered Grid Architecture, Open Grid Services Architecture (OGSA), Grid architecture models, Grid Resource Information Service (GRIS). Resource infrastructure.

UNIT 3: Grid Middleware: **(8)** Globus: Overview, resource specification language, information services, Globus Resource Allocation Manager (GRAM), Grid FTP protocol.

UNIT 4: Resource Management and Scheduling **(8)** Grid Scheduling and Resource Management, Scheduling Paradigms, Working principles of Scheduling, A Review of Condor, SGE, PBS and LSF-Grid Scheduling with QoS.

UNIT 5: Grid Portals and Security **(8)**

Functionality and underlying infrastructure for sample general and application specific portals; Grid security demands and solutions, Case Studies: Recent version of Globus Toolkit - Architecture, Components and Features

Text Books:

1.Foster, I. and Kesselman, C. (eds.). The Grid: Blueprint for a New Computing Infrastructure. Morgan Kaufmann Publishers, (1999).

Reference Books:

1. Luis Ferreira et al., Grid Computing in Research and Education, ibm.com/redbooks, (September 2003).

2. Maozhen Li, Mark Baker, “The Grid Core Technologies”, John Wiley & Sons, (2005).

MCS 112: Mathematical & Statistical Techniques in Computer Science

L T P: 3-1-0 **Credit: 4**

UNIT 1: Introduction, Computational Errors and their Analysis (8)
(Accuracy of numbers, Errors and a general error formula, Errors in Numerical Computations and Inverse Problems**,** Floating Point Representations of Numbers and operations**,** Errors in a Series Approximation)**. Algebraic & Transcendental Equations** (Order of convergence of iterative and bisection methods, Convergence of a Sequence, Iterative methods for system of non-linear equations, Regula flasi method, Secant method, Newton-Ralphson Method).

UNIT 2: Algorithmic Optimization (8)
(Assumptions for interpolation, errors in polynomial interpolation, finite differences, difference operators and their relationship**,** Newton's Gauss's, Stirling's & Laplace-Everett's formula for interpolation**,** Interpolation by unevenly spaced points: Lagrange's interpolation formula**). Numerical Integration, Differentiation & Ordinary Differential Equations** (Introduction to numerical differentiation Introduction to numerical integration, Trapezoidal and Simpson's rules, Introduction to numerical solution of ordinary differential equations, Euler's method , Runge-Kutta methods).

UNIT 3: Vector Calculus (8) (Scalar functions of several variables, Partial derivatives and differentiability, the gradient vector, vector fields) **Linear Systems, Orthogonality, Eigen values & Eigen vectors (**Vector spaces, Linear maps, Systems of linear equations, Orthogonality, orthogonal projections**,** Eigenvalues & Eigenvectors**,** QR & Singular value decomposition).

UNIT 4: Spectral Methods (8)
(Trigonometric approximation and interpolation, Trigonometric methods for differential equations**), Time Series Analysis (**Introduction to classical methods)**, Fourier and Wavelet Analysis (**Introduction to Fourier and wavelet transform and their applications in knowledge discovery & exploratory data analysis).

UNIT 5: Statistical Method (8) (Curve fitting: Principle of least squares (Fitting of $y=ae^{bx}$, $y=ax^{b}$, $y=ab^{x}$, $pv^{r}=k$, $xy=b+ax$, $y=ax+bx^{2}$))**,**Regression analysis**,** Techniques for statistical quality control, Testing of hypothesis.

Text Books:

1. Matheus Grasselli and Dimitry Pelinovsky, "Numerical Mathematics", Jones and Bartlet Publishers, USA.
2. M. Goyal, "Computer Based Numerical & Statistical Techniques", Infinity Science Press LLC, MA, USA.

Reference Book(s):

1. Lars Elden, "Mattrix Methods in Data Mining and Pattern Recognition", SIAM (Society for Industrial and Applied Mathematics), USA.

MCS 116: Pattern Recognition

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Introduction to pattern recognition systems and their design cycle, learning and adaptation. Bayes Decision theory- introduction, continuous case, 2-category classification, minimum error rate classification, classifiers, discriminant functions, and decision surfaces. Error probabilities and integrals, normal density**,** discriminant functions for normal density, Bayes Decision theory discrete case.

UNIT 2: Estimation **(8)**

Parameter estimation and supervised learning- Maximum likelihood estimation, the Bayes classifier, learning the mean of a normal density, general bayesian learning. Nonparametric technique- density estimation, parzen windows, k-nearest Neighbor estimation, estimation of posterior probabilities, k_n nearest neighbor rule, The nearest- neighbor rule, k-nearest neighbor rule.

UNIT 3: Linear Discriminant Functions **(8)**

Linear discriminant functions- linear discriminant functions and decision surfaces, generalized linear discriminant functions, The 2-category linearly separable case, non-separable behavior, linear programming procedures.

UNIT 4: Unsupervised Learning and Clustering **(8)**

Unsupervised learning and Clustering: Mixture Densities and Identifiability, Maximum-Likelihood Estimates, Application to normal mixtures, Unsupervised Bayesian learning, Data Description and Clustering, Hierarchical Clustering.

UNIT 5: Applications and Case Studies **(8)**

Applications of Pattern Recognition to the areas of Data Security, Defense and Medical, Case Studies on defense and medical fields.

Text Books:

1. Duda and Hart P.E, “Pattern classification and scene analysis”, John Wiley and sons, NY.

Reference Books:

1. Earl Gose, Richard Johnsonbaugh, and Steve Jost, “Pattern Recognition and Image Analysis”, PHI Pvt. Ltd., NewDelhi.
2. Fu K.S., Eaglewood cliffs, “Syntactic Pattern recognition and applications”, Prentice Hall, N.J.
3. Rochard O. Duda , Hart P.E, and David G Stork, “Pattern classification” , John Wiley & Sons Inc.

MCS 009: Software Quality Metrics & Testing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction (8)

Popular Views. Quality: Professional Views, Software Quality, Total Quality Management, The Object-Oriented Development Process, The Clean room Methodology, The Defect Prevention Process, Process Maturity Framework and Quality Standards, The SEI Process Capability Maturity Model, The SPR Assessment, The Malcolm Baldrige Assessment.

UNIT 2: Fundamentals in Measurement Theory (8)

Definition, Operational Definition, and Measurement, Level of Measurement, Some Basic Measures, Reliability and Validity, Measurement Errors, Assessing Reliability, Correction for Attenuation, Complexity Metrics and Models, Lines of Code, Cyclomatic Complexity, Syntactic Constructs.

UNIT 3: Software Quality Metrics Overview (8)

Product Quality Metrics, Defect Density Metric, Customer Problems Metric, Customer Satisfaction Metrics, In-Process Quality Metrics, Defect Density During Machine, Testing. Defect Arrival Pattern During Machine Testing, Phase-Based Defect Removal Pattern, Defect Removal Effectiveness, Metrics for Software Maintenance, Fix Backlog and Backlog Management Index, Fix Response Time and Fix Responsiveness, Percent Delinquent Fixes, Fix Quality.

UNIT 4: Applying the Basic Quality Tools in Software Development (8)

Ishikawa's Seven Basic Tools, Checklist, Pareto Diagram, Histogram, Run Charts, Scatter Diagram, Control Chart, Cause-and-Effect Diagram, Relations Diagram, Defect Removal Effectiveness and Quality Planning, Phase-Based Defect Removal Model, Cost Effectiveness of Phase Defect Removal. Defect Removal Effectiveness and Process Maturity Level

UNIT 5: Testing (8)

Objectives and issues of testing, Testing activities and levels, White-Box and Black-Box Testing, Test Planning and Design, Unit Testing, Data flow testing, functional testing, system testing, In-Process Metrics for Software Testing, Testing Defect Arrivals Over Time. Testing Defect Backlog Over Time. In-Process Metrics and Quality Management, Case Studies.

Text Books:

1. Stephen H. Kan, “Metrics and Models in Software Quality Engineering”, Addison Wesley.

Reference Books:

1. Sagar Naik and Piyu Tripathy, “Software Testing and Quality Assurance: Theory and Practice”, Wiley.
2. Paul C. Jorgensen, “Software Testing - A Craftsman’s Approach”, CRC Press.

MCS 012: Software Project Management

L T P: 3-0-0 **Credit: 3**

Unit-1: Introduction to Software Project Management (SPM) (11)

Definition of a Software Project (SP), SP Vs. other types of projects activities covered by SPM, categorizing SPs, project as a system, management control, requirement specification, information and control in organization, Stepwise Project planning: Introduction, selecting a project, identifying project scope and objectives, identifying project infrastructure, analyzing project characteristics, identifying project products and activities, estimate efforts each activity, identifying activity risk, allocate resources, review/ publicize plan.

Unit-2: Project Evaluation and Estimation (8) Cost benefit analysis, cash flow forecasting, cost benefit evaluation techniques, risk evaluation. Selection of an appropriate project report; Choosing technologies, choice of process model, structured methods, rapid application development, water fall-, V-process-, spiral- models. Prototyping, delivery. Albrecht function point analysis.

Unit-3: Activity Planning & Risk Management (8)

Objectives of activity planning, project schedule, projects and activities, sequencing and scheduling activities, network planning model, representation of lagged activities, adding the time dimension, backward and forward pass, identifying critical path, activity throat, shortening project , precedence networks, Risk Management: Introduction, the nature of risk, managing risk, risk identification, risk analysis, reducing the risks, evaluating risks to the schedule, calculating the z values..

Unit-4: Resource Allocation & Monitoring the Control (5)

Introduction, the nature of resources, identifying resource requirements, scheduling resources creating critical paths, counting the cost, being specific, publishing the resource schedule, cost schedules, the scheduling sequence, Monitoring the control: Introduction, creating the frame work, collecting the data, visualizing progress, cost monitoring, earned value, prioritizing monitoring, getting the project back to target, change control.

Unit-5: Managing Contracts and People (8)

Introduction, types of contract, stages in contract, placement, typical terms of a contract, contract management, acceptance, Managing people and organizing terms: Introduction, understanding behaviour, organizational behaviour: a back ground, selecting the right person for the job, instruction in the best methods, motivation, working in groups, becoming a team, decision making, leadership, organizational structures, conclusion, further exercises..

Text Books:

1. Bob Hughes and Mike Cotterell, Software Project Management 1999, TMH

Reference Books:

1. Roger S. Pressman “Software Engineering – A Practitioner’s approach”, MGH
2. Software Project Management, Walker Royce, Addison Wesley.
3. Project Management 2/c. Maylor
4. Ramesh, “Managing Global software Projects” , TMH.

MCS 118: Software Architecture & Design Pattern

L T P: 3-0-0 **Credit: 3**

UNIT 1: Software Architectural Design **(8)**

Introduction to Software Architecture, important, Architectural structures and view, Software architectural attributes, Attribute types, Trade-off of attributes and choices. Software architectural styles: Pipes & Filters, Layered, Event-based, Implicit Invocation, Data-centred, Interpreter, MVC, Message dispatcher, Multi-tier distributed.

UNIT 2: Software Architectural Notations in UML **(8)**

User interface architecture and design, Domain-specific architecture: Concepts, Domain engineering, Evaluation of architectural design. Process: Unified Process, Rational Unified Process inception, elaboration, construction, transition.

UNIT 3: Introduction to Software Detail Design **(8)** Object-oriented design: Object identifications, Static connection, Dynamic connection, Object Oriented System Development Methodology, Object Oriented Systems Development Life Cycle, Design axioms, Designing Classes, Access Layer, Object Storage and Object Interoperability.

UNIT 4: Patterns and Design Patterns **(8)**

Introduction to Pattern and Design Pattern, GOF, Pattern Categories and Relationships between Patterns. Pattern oriented Design: Creational Patterns- singleton, factory method, abstract factory, Structural Patterns- adapter, decorator, façade, Behavioural Patterns- iterator, observer, command and state, strategy.

UNIT 5: Component Oriented Design: **(8)**

Interface of components, implementation of interface, Assembly and deployment of components, Connections between components, Evaluation of detail software design.

Text Books:

1. Erich Gamma, Richard Helm, Ralph Johnson, and John Vlissides , “Design Patterns: Elements of Reusable Object-Oriented Software”, Addison-Wesley.

Reference Books:

1. Grady Booch, “Object-Oriented Design with Applications” Addison Wesley.
2. Martine Fowler, “UML Distilled”, Addison Wesley.
3. Frank Buschmann Regine Meunier, Hans Rohnert**,** Peter Sommerlad, Michael Stal, “Pattern-Oriented Software Architecture: A System of Pattern”, John WileSons.

MCS 008: Recent Advances in Software Engineering

L T P: 3-0-0 **Credit: 3**

UNIT 1: Formal Methods and Clean Room Engineering (8)
Basic Concepts, Mathematical Preliminaries, Applying Mathematical Notation for Formal Specification, Formal Specification Languages, the Ten Commandments of Formal Methods, The Clean room Approach, Functional Specification, Clean room Design, Clean room Testing

UNIT 2: Client/Server Software Engineering (8)
The Structure of Client/Server Systems, Software Engineering for Client server Systems, Analysis Modelling Issues, Design for c/s Systems, Testing Issues

UNIT 3: Agent Based Software Engineering (8)
Motivation for Agent based Computing, Agent Definition, Key Concepts and Models, Agent Architectures, Agent Knowledge Representation.

UNIT 4: Web Engineering and Reengineering (8)
The Attributes of Web-Based Applications, the WebE Process, A Framework for WebE, Formulating/Analyzing Web-Based Systems, Design for Web-Based Applications, Testing Web-Based Applications, Business Process Reengineering, Software Reengineering, Reverse Engineering, Restructuring, Forward Engineering, The Economics of Reengineering

UNIT 5: Software Reliability (8)
Definition , Reliability Terminologies –,Classification of failures , Reliability Metrics ,Software Reliability Models, S/W Reliability Allocation Models , Trending Reliability Techniques, Predicting Reliability Techniques, Case Studies.

Text Books:

1. Roger S. pressman, “Software Engineering: A Practitioner’s Approach” 5th edition McGraw Hill

Reference Books:

1. Stuart Russell, Peter Norvig, “Artificial Intelligence-A Modern Approach”, Pearson Education
2. Bigus & Bigus, “Constructing Intelligent agents with Java ", Wiley, 1997.
3. John Musa, “Software Reliability Engineering”, McGraw-Hill
4. Jeff Tian, Software Quality Engineering (SQE), Wiley

MCS 110: Object Oriented Software Engineering

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Software Engineering Development, Software Life Cycle Models, Standards for developing life cycle models. Object Methodology & Requirement Elicitation: Introduction to Object Oriented Methodology, Overview of Requirements Elicitation, Requirements Model-Action & Use cases, Requirements Elicitation Activities, Managing Requirements Elicitation.

UNIT 2: Architecture **(8)**

Model Architecture, Requirements Model, Analysis Model, Design Model, Implementation Model, Test Model.

UNIT 3: Modelling with UML **(8)**

Basic Building Blocks of UML, A Conceptual Model of UML, Basic Structural Modelling, UML Diagrams.

UNIT 4: System Analysis and Design **(8)**

Analysis Model, Dynamic Modelling & Testing, Design concepts & activities, Design models, Block design, Testing.

UNIT 5: Testing Object Oriented Systems **(8)**

Introduction, Testing Activities & Techniques, The Testing Process, Managing Testing, State Based testing and Data flow testing for Classes. Component Based Computing. Definition and nature of components, components and interfaces, Interfaces as contracts, the benefits of components. Basic Techniques: component design and assembly, Relationship with the client-server model and with patterns, Use of objects and object lifecycle services, use of object brokers.

Text Books:

1. Bernd Bruegge and Allen H. Dutoit,"Object oriented Software Engineering, using UML, Pattern and Java" Pearson (2nd Edition).
2. George Wilkie, "Object oriented Software Engineering", Addison-Wesley.

Reference Books:

1. Ivar Jacobson "Object Oriented Software Engineering: A Use Case Driven Approach", Addison-Wesley.
2. Grady Booch "Object-Oriented Analysis and Design with Applications", Addison-Wesley Professional.
3. Stephen R. Scach, "Object Oriented and Classical Software Engineering (Seventh Editon)" Tata McGraw Hill.
4. Booch, Rumbaugh & Jacobson "The Unified Modelling Language User Guide", Addison-Wesley.

5. Bernd Bruegge, Allen H. Dutoit “Object Oriented Software Engineering: Using UML, Patterns and Java” (Second Edition), Pearson Education.
6. Timothy C. Lethbridge, Robert Laganiere “Object oriented Software Engineering: Practical Software development using UML and Java” McGraw Hill.

MCS 007: Object-Oriented Modelling & Design

L T P: 3-0-0 **Credit: 3**

UNIT 1 **(8)**

Introduction, Modelling Concepts, class Modelling: What is Object Orientation? What is OO development? OO themes; Evidence for usefulness of OO development; OO modelling history. Modelling as Design Technique: Modelling; abstraction; The three models, Class Modelling: Object and class concepts; Link and associations concepts; Generalization and inheritance; A sample class model; Navigation of class models; Practical tips.

UNIT 2 **(8)**

Advanced Class Modelling, State Modelling: Advanced object and class concepts; Association ends; N-ary associations; Aggregation; Abstract classes; Multiple inheritance; Metadata; Reification; Constraints; Derived data; Packages; Practical tips. State Modelling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior; Practical tips.

UNIT 3 **(8)**

Advanced State Modelling, Interaction Modelling: Advanced State Modelling: Nested state diagrams; Nested states; Signal generalization; Concurrency; A sample state model; Relation of class and state models; Practical tips. Interaction Modelling: Use case models; Sequence models; Activity models. Use case relationships; Procedural sequence models; Special constructs for activity models.

UNIT 4 **(8)**

Process Overview, System Conception, Domain Analysis: Process Overview: Development stages; Development life cycle. System Conception: Devising a system concept; Elaborating a concept; Preparing a problem statement. Domain Analysis: Overview of analysis; Domain class model; Domain state model; Domain interaction model; Iterating the analysis.

UNIT 5 **(8)**

Application Analysis, System Design: Application Analysis: Application interaction model; Application class model; Application state model; Adding operations. Overview of system design; Estimating performance; Making a reuse plan; Breaking a system in to sub-systems; Identifying concurrency; Allocation of sub-systems; Management of data storage; Handling global resources; Choosing a software control strategy; Handling boundary conditions; Setting the trade-off priorities; Common architectural styles; Architecture of the ATM system as the example.

Text Books:

1. Michael Blaha, James Rumbaugh , “Object Oriented Modeling and Design with UML “, (Second Edition), Pearson Education.

2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal “Pattern- Oriented Software Architecture A System of Patterns”(Volume 1), John Wiley and Sons.

Reference Book:

1. Grady Booch et al , “Object-Oriented Analysis and Design with Applications” (Third Edition), Pearson.

MCS 010: Formal Methods in Software Engineering

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

Introduction to Formal methods, Software Correctness, limitations of testing, formal methods (relation with testing), Difficulties in Formal methods, Proof Automation, mathematical modeling of software.

UNIT 2: Propositional and First Order Logic **(8)** Logic in Computer Science, formalization, (Syntax and semantics), calculus, syntax and semantics of propositional logic, first order atomic formulas, first order semantics and first order models, temporal logic, semantics of temporal logic, finite state machines.

UNIT 3: Formal Software Specification Methods **(8)**

Introduction, Specification and requirements, Specification languages and Applications, effectiveness of specifications.

UNIT 4: Modeling and Model Checking with Case Study **(8)** Model checking, Automatic test case generation, invariant and property checking, Tools for type checking, well formedness checking, Raise Tool and Specification (RSL), case study: A proxy server.

UNIT 5: Quality Assurance with FM **(8)**

Correctness of properties, theorem proving and property driven approaches.

Text Books:

1. Ben-Ari Mordechai Ben-Ari: Principles of the Spin Model Checker, Springer, 2008.
2. Backhouse R, Program Construction:" Calculating Implementations from specifications, Wiley 2003.

Reference Books:

1. B. Beckert, R. H Ahnle, and P. Schmitt, editors. Verification of Object-Oriented Software: The KeY Approach, vol 4334 of LNCS. Springer, 2006. Chapters 1 and 10 only.
2. G.J. Klir and B. Yuan "Fuzzy Sets & Fuzzy Logic", PHI.
3. Holzmann Gerard J. Holzmann: The Spin Model Checker, Addison Wesley, 2004.
4. Schnider, S., "The B Method: An Introduction. Palgrave", 2001.

OEM 001: Modeling and Simulation

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(8)**

The Modelling Process: Statistics of Simulation and Monte-Carlo Simulation, Estimating π and log(x) using a dartboard, Model Analysis, Validation and Verification, Terminology & Components, Discrete vs. Continuous time, Process flow in simulation study, Simulation Examples, Queuing systems, Communications networks, General Principles: Event -driven simulation, World Views, List processing, Human-System Integration and Training Applications, Current and Future Directions of Simulation for Complex Systems.

UNIT 2: Mathematical Background **(8)** Random Number Generation: Properties of Random Numbers, Generation of Pseudo-Random Numbers, Uniform pseudo-RNGs: properties, Testing for Randomness, Pitfalls, Random Variate Generation: Inverse Transform, Direct Transform, Convolution, Accept-Reject, use of random numbers in different applications.

UNIT 3: Queueing Models **(8)**

Characteristics of queueing systems, queueing notations, long run measures of performance of queueing systems, Steady state behaviour of Markovian models (M/G/1, M/M/1, M/M/c) overview of finite capacity and finite calling population models, Network of Queues.

UNIT 4: Simulation Process **(8)** Statistical models:- Terminology and Concepts, Useful Statistical Models, Distributions, Queuing models:- Characteristics, Performance Measures, Steady-State Behavior, Networks of Queues, Input Modeling:- Collecting Data, Identifying Distribution, Histograms, Parameter Estimation, Goodness-of-Fit, Selecting Input Model without Data, Output Analysis:- Types of Simulations with Respect to Output Analysis, Stochastic Nature of Output Data, Measures of Performance, Output Analysis for Termination Simulations, Output Analysis for Steady-State Simulations

UNIT 5: Simulation Software and Case Study **(8)** History, Selection process, interpreted vs. compiled simulators, Future trends, Simulation in High Level Languages, Simulation packages, Simulation environment in Simulink and Matlab. Case Studies: Simulation of manufacturing systems, Simulation of Material Handling system, Simulation of computer systems, Simulation of super market, Cobweb model, and any service sectors.

Text Books:

1. Banks J., Carson J. S., Nelson B. L., and Nicol D. M., “Discrete Event System Simulation”, 3rd edition, Pearson Education, 2001.
2. Law M, Kelton W, Simulation Modeling and Analysis. McGraw-Hill, New York, NY, 2000

Reference Books:

1. Hoel, Port, and Stone, Introduction to Stochastic Processes. Houghton Mifflin.
2. Gilks, Richardson and Spiegelhalter, Markov Chain Monte Carlo Methods in Practice, Chapman and Hall.
3. Discrete-Event System Simulation (4rd edition), Jerry Banks, John Carson, Barry L. Nelson, David Nicol, Prentice Hall, 2005
4. Law M, Kelton W, Simulation Modeling and Analysis. McGraw-Hill, New York, NY, 2000
5. Madachy R. Software Process Dynamics, Wiley/IEEE Press, 2007
6. Introduction to System Modeling and Simulation: Overview, Continuous, Discrete Event, Combined, and Other Modeling Techniques, Simulation Software Tools

MCS 107: Soft Computing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Neural Networks **(8)** History, overview of biological Neuro-system, Mathematical Models of Neurons, architecture, Learning rules, Learning Paradigms-Supervised, Unsupervised and reinforcement Learning, ANN training Algorithms-perceptions, Training rules, Delta, Back Propagation Algorithm, Multilayer Perceptron Model, Hopfield Networks, Associative Memories, Applications of Artificial Neural Networks.

UNIT 2 : Fuzzy Logic **(8)**

Introduction to Fuzzy Logic, Classical and Fuzzy Sets: Overview of Classical Sets, Membership Function, Fuzzy rule generation. Operations on Fuzzy Sets: Compliment, Intersections, Unions, Combinations of Operations, Aggregation Operations.

UNIT 3: Fuzzy Arithmetic **(8)** Fuzzy Numbers, Linguistic Variables, Arithmetic Operations on Intervals & Numbers, Lattice of Fuzzy Numbers, Fuzzy Equations. Fuzzy Logic: Classical Logic, Multi-valued Logics, Fuzzy Propositions, Fuzzy Qualifiers, Linguistic Hedges.

UNIT 4: Uncertainty Based Information **(8)**

Information & Uncertainty, Non-specificity of Fuzzy & Crisp Sets, Fuzziness of Fuzzy Sets. Introduction of Neuro-Fuzzy Systems

UNIT 5: Architecture of Neuro fuzzy Networks **(8)**

Application of Fuzzy Logic: Medicine, Economics etc. Genetic Algorithm: An Overview, GA in problem solving, Implementation of GA

Text Books:

1. S.N.Sivanandam, “Principles of Soft Computing”, John Wiley-India edition.
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, PHI.

Reference Books:

1. Anderson J.A., “An Introduction to Neural Networks”, PHI.
2. G.J. Klir and B. Yuan “Fuzzy Sets & Fuzzy Logic”, PHI.
3. Melanie Mitchell “An Introduction to Genetic Algorithms”, PHI.

Annexure-XXIV-B of Agenda Item no. 6.23

M.Tech.

in

Electronics and Communication Engineering
With specialization in
Microwave Technology

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2012-13)

Department of Electronics and Communication Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Electronics and Communication Engineering	
School:	School of Engineering and Technology	
Name of the Course:	M.Tech. in ECE with specialization in Microwave Technology	
Duration:	Two (02) years	
Total No. of Credits:	66	
Date of meeting of BOS:	July 12, 2012	
Members of BOS:	1. Prof. R. M. Mehra, HOD, ECE	Chairman
	2. Prof. H. M. Gupta, IIT Delhi	External Member
	3. Prof. Avinashi Kapoor, University of Delhi	External Member
	4. Dr. Rajeev Srivastava, ST Microelectronics	External Member
	5. Dr. Amitava Majumdar, Moser Baer India	External Member
	6. Mr. Sandeep Singh, Coordinator, ECE	Internal member
	7. Ms Rashmi Priyadarshini, ECE	Internal member
	8. Ms Noor e Zahra, ECE	Internal member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

Course Structure

M.Tech. in ECE with specialization in Microwave Technology, Sharda University

Sem.	Courses (L-T-P)							Lecture Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	**C-1-1** **(3-1-0) 4** Electromagnetic Field and Transmission Line **(DC)**	**C-1-2** **(3-1-0) 4** Communication Systems **(DC)**	**C-1-3** **(3-0-0) 3** Microwave Tubes and Solid state devices **(DC)**	**C-1-4** **(3-0-0) 3** Microwave Measurement Techniques and Applications **(DC)**	**C-1-5** **DE I** **(3-0-0) 3**	**Practical** **(0-0-4)2** Microwave Measurements Laboratory	**Foreign Language** **(1-0-2)2**	**6**	**16**	**2**	**6**	**24**	**21**
II	**C-2-1** **(3-0-0) 3** Satellite Communication **(DC)**	**C-2-2** **(3-0-0) 3** MIC and MMIC **(DC)**	**C-2-3** **(3-0-0) 3** **DE II**	**C-2-4** **(3-0-0) 3** **DE III**	**C-2-5** **(3-0-0) 3** **O E I**	**Practical** **(0-0-4)2** Microwave Circuits CAD Laboratory	**Technical Communication** **(1-0-2)2**	**6**	**16**	**0**	**6**	**22**	**19**
III	**Seminar** **2**	**Project** **4**	**Dissertation** **8**						-	-	-	-	**14**
IV	**Dissertation**							-	-	-	-	-	**12**

C-X-Y (Course-Semester-Paper No.); L-lecture, T-tutorial, P-practical

Total Credits – 66

Legends

Foreign Language	: 02
Technical Communication	: 02
Departmental Core (DC)	: 20
Practicals	: 04
Departmental Elective (DE)	: 09
Open Elective (OE)	: 03
Seminar	: 02
Project	: 04
Dissertation (Semester III and IV)	: 20
TOTAL	**: 66**

LIST OF DEPARTMENTAL CORE

1. Electromagnetic Field and Transmission Line MWT 101
2. Communication Systems MWT 110
3. Microwave Tubes & Solid State Devices MWT111
4. Microwave Measurement Techniques and Applications MWT 105
5. Satellite Communication System MWT 013
6. MIC and Monolithic Microwave Integrated Circuits (MMIC) MWT109

LIST OF DEPARTMENTAL ELECTIVES

1. Antennas MWT 003
2. Cavity Measurements MWT 008
3. Radar Systems and Signal Processing MWT 004
4. Mobile and Wireless Communication MWT 005
5. Photonics and Optical Switching MWT 002
6. Microwave Passive Circuits MWT 106
7. Microwave Active Circuits MWT 011
8. Computational Electromagnetic MWT 006
9. Remote Sensing MWT 007

Seminar MWT 251
Project MWT 252
DissertationI MWT 253
DissertationII MWT 254

M.Tech.

in

Electronics and Communication Engineering

with specialization in

Microwave Technology

SYLLABI

M.Tech. Electronics & Communication in Microwave Technology
Semester I

Departmental Core:

MWT 101: Electromagnetic Field and Transmission Line

L T P: (3-1-0) **Credit: 4**

Unit 1: Review of electromagnetic field equation and their rotation. Skin depth, Propagation constant, Attenuation constant & phase constant, Electric & Magnetic fields in ellipsoids, Method of calculation, Circular polarization, Demagnetizing Factors & Depolarizing Factors. (10 hrs)

Unit 2: Matrix Representation of network: The impedance matrix, the admittance matrix, The Cascade matrix, Transmission line parameters, Telegraphists' equations. The Propagation of Waves on Transmission Lines: The wave equation, Solution of wave equations, Characteristics impedance and characteristics admittance, Power, Terminated lines, Short circuited line, Open Circuited Line, Lumped-Element, Equivalents of Lines. (10 hrs)

Unit 3: Transmission: Line Application & Techniques; The Quarter-wave Transformer, Stub Matching, Binomial Matching, Line Connections, The Parallel-Plate Line, The Coaxial Line, Application of Conformal Mapping, The strip transmission Line. (10 hrs)

Unit 4: Review of rectangular & circular wave guides. In homogeneously Filled Wave guides: Dielectric Slab- Loaded Rectangular Guides, The ray leigh - Qitz method, Ferrite slabs in rectangular guides, Excitation of different modes in a wave guide. Perturbation techniques & its application, variation techniques & its application. (10 hrs)

Reference Books:

1. Elements of Engineering Electromagnetics – N.N. Rao, Pearson Education
2. Field and Wave Electromagnetics – D.K. Cheng, Pearson Education
3. Electromagnetic Waves & Radiating systems – Jordan & Balmain, TMGH
4. Electromagnetic Field Theory and Transmission Lines-Raju, Pearson Education

MWT 110: Communication Systems:

L T P: (3-1-0) **Credit: 4**

Unit 1: Fourier transform, Convolution theorem, statements of time & frequency domain convolution. Power spectral density, Energy spectral density. Parseval's theorem. (08 hrs)

Unit 2:Free space wave propagation, ground reflection, effect of earth on propagation, effect of terrain on free transmission, diffractions and scattering from obstacles, atmospheric attenuation, Troposphere propagation, fading characteristics, calculation of troposcatter loss. (12 hrs)

Unit 3: Fading in LOS troposcatter. Baye's theorem, Probability density and probability distributions functions, Transformation of probability distribution functions, basic concept of random process, stationary and non-stationary process correlation functions, Ergodic process. (12 hrs)

Unit 4: Noise: Different types of noise, Thermal, shot, flicker noise, Noise figure, Equivalent noise temperature. (08 hrs)

Reference Books:

1. Communication Theory: Epistimological Foundations- James Arthur Anderson; Guilford Press (1996)
2. Communication Theory- T. G. Thomas, S. Chandra Sekhar; Tata McGraw Hills (2005)
3. Radio Wave Propagation: An Introduction to Non-Specialist- John Alan Richards; Springer (2008)

MWT 111: Microwave Tubes & Solid State Devices

L T P: (3-0-0) **Credit: 3**

Unit: 1 Limitation of Conventional Tubes: Classification of Microwave tubes; O-type Tubes; M-type Tubes. Klystron, Multicavity Klystron, Travelling Wave Tubes: Amplification process; Convection Current; Axial Electric Field; Wave modes. (11 hrs)

Unit: 2 Magnetron Oscillator, voltage tunable magnetrons, Electron gun; RF input/output couplers; Magnetic focusing structures and collectors RF wave and beam interaction; Millimeter wave generation and amplification and free electron losers and its applications. (11 hrs)

Unit: 3 Varactor Diode, Schottky Diode, Gunn Diode: Gunn Effect; Two valley theory; typical characteristics; Tunnel Diode and its Applications: principle of operation; V-I characteristics. (9 hrs)

Unit: 4 Avalanche Transit time devices, Power amplifiers MODFET operation; Characteristics and applications; Monolithic Microwave integrated circuits (MMIC): Introduction and application areas.(9 hrs)

Reference Books:

1. Microwave Devices and Circuits, Samual Y. Liao, Prentice Hall Publication, Third Edition.
2. Foundation for Microwave Engineering by R.E Collin, IEEE Press Series on Electromagnetic Wave Theory, Second Edition.
3. Microwave Engineering by D.M. Pozar, John Wiley, Third Edition

MWT 105: Microwave Measurement Techniques and Applications

L T P: (3-0-0) Credit: 3

Unit 1: Microwave wave guides: Attenuators; phase shifters; matching loads (circuits); detectors; directorial couplers; tuners; slotted waveguides and H plane Tee Hybrid Tee circulators and isolators; signal generators; Noise sources and noise meters; Frequency meters and VSWR meters; Microwave measurement of frequency; attenuation. (11 hrs)

Unit 2: Slotted line VSWR measurement; Calibration of detector system; Calibration of slotted section for low loss termination; VSWR through return loss measurements; impedance measurement insertion loss and attenuation measurements- measurement of scattering parameters; Dielectric constant measurement of a solid using waveguide. (11 hrs)

Unit 3: Low Power Measurement: Bridge Techniques; Accuracy of measurements; High Power Measurements: Calorimetric Measurements. Cavity Measurements; Radiation pattern and gain of an antenna. (9 hrs)

Unit 4: Microwave in process control instrumentation; microwave waste disposal; application of microwave in agriculture and medicine; hyperthermia etc. Microwave heating; Microwave absorbers; EMC and EMI. (9 hrs)

Suggested Reading:

1. Microwave Measurements, 3rd Edition- Richard Collier and Douglas Skinner, Institute of Engineers
2. Principles of Microwave Measurements, G.H. Bryant, Institute of Engineers
3. Technique of Microwave Measurements: v. 1, Carol G. Montgomery (Editor), Amazon.co.uk

Departmental Elective I

MWT 003: Antennas

L T P: (3-0-0) **Credit: 3**

Unit 1: Definitions, antennas as aperture arrays of point sources, review of dipoles, loop and their linear antennas. Helical antenna, bicomical and spheroidal antenna internal equation methods. (10 hrs)

Unit 2: Self and mutual impedances arrays, design and synthesis, reflector type antennas, Banbiner's principle and complementary antennas, Application of reaction concept and vocational principles in antennas and propagation. (12 hrs)

Unit 3: Frequency independent antennas, scattering and diffraction, selected topics in microwave antennas. (9 hrs)

Unit 4: antennas measurements application in broad casting, microwave links, satellite communication and radio astronomy. (9 hrs)

Reference Books:

1. Antenna Theory: Analysis and Design- Constantine A. Balanis; 2nd edn, John Wiley and Sons
2. Antenna and Wave Propagation- John D. Kraus; 4th edn, Tata McGraw Hill
3. Antenna and Wave Propagation- K. D. Prasad; 3rd edn, Satya Prakashan and Sons

MWT 108: Cavity Measurements

L T P: (3-0-0) **Credit: 3**

Unit 1: Rectangular Cavity Resonator, Circular Cavity Resonator & Semi-circular Cavity Resonator. Q factor, band width, dielectric and magnetic properties of materials. (11 hrs)

Unit 2: Measurements of power, Excitation of Resonators & cavity perturbations. (9 hrs)

Unit 3: Principle of time domain and frequency domain, reflectrometry, spectrum analyzer and network analyzer. (11 hrs)

Unit 4: Measurements of scattering parameters. (9 hrs)

Reference Books:

1. Microwave resonant cavity measurement of shock produced electron precursors, Samuel Lederman, Daniel S. Wilson, Defense Technical Information Center.

MWT 004: Radar Systems and Signal Processing

L T P: (3-0-0) **Credit: 3**

Unit 1: Analysis of discrete time signal, sampling theorem, estimation of frequency content in a signal, discrete Fourier transforms, random discrete signal analysis. Review of probability, auto and cross correlation, power spectral density, cross spectra. Spectral analysis of random signals, sampling autocorrelation function. (11 hrs)

Unit 2: Radar equations for tracking, volume search, jamming and cluttering. Non coherent MTI, MTI from moving platform, Pulse compression radar. (9 hrs)

Unit 3: Phased array, synthetic aperture Radars, Radar antenna systems, ECCM techniques. detection of variable amplitude signals, matched filters, detection of random signal and estimation of signals in noise. (10 hrs)

Unit 4: Window function, spectral estimates, parametric and non parametric estimates. Detection of signals in noise, optimum detection algorithms, minimum probability of error. Neyman-Pearson criteria for radar application to air traffic control, radar sub optimum processor. (10 hrs)

Reference Books:

1. N. Levanon, and E. Mozeson, Radar Signals, Wiley-Interscience, 2004.
2. P. Z. Peebles, Radar Principles, John Wiley, 2004.
3. M. I. Skolnik, Introduction to Radar Systems, Tata McGraw Hill, 2001.

Semester II

Departmental Core

MWT 013: Satellite Communication System

L T P: (3-0-0) **Credit: 3**

Unit 1: Introduction to Satellites and their Applications, Passive and Active Satellite, Orbital Mechanics, Look Angle and orbit determination, Polar, Geosynchronous and Geostationary Satellites, Low Earth Orbit and non-Geostationary Satellite, Launch and launch Vehicles, Satellite Stabilization, Eclipse, Earth Coverage and Ground tracks. (10 hrs)

Unit 2: Satellite Station (Space Segment), Satellite Sub-System, Mechanical Structure, Propulsion sub-system, Thermal control sub-system, Altitude and orbit control, Power supply – sub system, Tracking Telemetry and command sub-system, Payload, Antenna sub-system. (10 hrs)

Unit 3: Earth Station Configuration & Technologies, Earth Station sub-system, High Power Amplifier, Low – Noise Amplifier, UP/Down Converter, Modulation Technique, Error Control for Digital Satellite Link (FEC), Multiplexing Technique, Antenna, Multiple Access Technique; FDMA, TDMA, CDMA/SSMA, SDMA. (10 hrs)

Unit 4: Satellite Link Design; Transmission Equation, Satellite Link Parameters, Frequency Allocation and Co-ordination, Propagation consideration; Path Loss, Fading etc, Noise consideration, Interference, Antenna Gain-to-Noise Temperature (G/T) Ratio, Link Budget, Transponder Planning, Satellite Applications; Communication Satellites, Remote Sensing Satellites, Weather Satellites, Navigation Satellites. (10 hrs)

Reference Books:

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition,2006.
2. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'SatelliteCommunication Systems Engineering', Prentice Hall/Pearson, 2007.

MWT 109: MIC and Monolithic Microwave Integrated Circuits (MMIC)

L T P: (3-0-0) **Credit: 0**

Unit 1: Design aspects of strip lines, Dielectric substrates - thick film technology and materials - thin film technology. (10 hrs)

Unit 2: Fin lines, Bandwidth, Power and frequency optimization**,** Impedance Matching. (9 hrs)

Unit 3: Micro-strip lines Coupled microstrips – even and odd mode analysis – microstrip directional couplers – branch line couplers – periodic branch line couplers – synchronous branch line couplers. (11 hrs)

Unit 4: MIC & MMICs. MIC active devices. encapsulation of devices for MICs – mounting of active devices. (10 hrs)

Reference Books:

1. Microwave Integrated Circuits– Gupta,K.C, and Amarjit singh – John Wiley and sons – Wiley Eastern Reprint, 1978.
2. Hoffmann, R.K – "Handbook of Microwave Integrated Circuits" – Artech House.

Departmental Elective II

MWT 005: Mobile and Wireless Communication

L T P: (3-0-0) **Credit: 3**

Unit 1: Wireless Transmission: Frequencies, regulations, Signals, Antennas, Signal Propagation, path loss, Multi path and other effects. (10 hrs)

Unit 2: Multiplexing: SDM, FDM, TDM, and CDMA Modulation Techniques: ASK, FSK, PSK, Multi-carrier and Spread Spectrum: their use in Mobile and Wireless Communication Systems. (10 hrs)

Unit 3: Access Control Mechanisms: SDMA, FDMA, TDMA, CDMA and their performance evaluation. (10 hrs)

Unit 4: Wireless Networks: Satellite networks, Wireless LAN, Wireless ATM. OSI, Mobile Network and transport layers, their protocols and implementation, Wireless Application Protocol. (10 hrs)

Reference Books:

1. T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
2. W. Stallings, "Wireless Communications and Networks", Prentice Hall, 2002.
3. V.K. Garg, "IS-95 CDMA and CDMA 2000", Prentice Hall PTR, 2000.
4. Leon-Garcia and I. Widjaja, "Communication Networks, Fundamental Concepts and Key Architectures", McGraw-Hill, 2000.
5. J.Schiller,"Mobile Communications", Addison Wesley, 2000.
6. Fred Halsall, "Multimedia Communications, Applications, Networks, Protocols and Standards", Addison Wesley, 2001.
7. Uyless Black ,"Mobile and Wireless Networks" , Prentice Hall PTR, 1996.

MWT 002: Photonics and Optical Switching

L T P: (3-0-0) **Credit: 3**

Unit 1: Electro-absorption modulators, quantum well EAM, electro-optic modulators, quantum well EOM, self electro-optic effect device, bipolar controller modulator, optoelectronic amplification, Programmable memory device, switching speed and energy. (11 hrs)

Unit 2: Opto-electronic integrated circuits: Hybrid and Monolithic integration, Integrated optical Transmitters and receivers. (10 hrs)

Unit 3: Guided wave devices: wave guides, couplers, splitters and combiners. Active guided wave devices. (9 hrs)

Unit 4: Optical Bi-stability, digital Optics, Optical switches, temporal, spatial, wavelength and spectral domain switching, multidimensional and multilevel photonic switching, Self routing, ATM switching. (11 hrs)

Suggested Reading

1. Optical Fiber Communications - Gerd Keiser, Mc.Graw hill International
2. Opto- Electronics, An Introduction- J. Wilson and J.F.B. Hawks, PHI
3. Fundamentals of Fiber optics in Telecommunication and Sensor system.-Bishnu Pal, New Age International (P) Ltd.
4. Optics (Fourth edition)- Eugene Hecht, Pearson Education.
5. Optical information processing- Mir Mojtaba Mirsalehi
6. Semiconductor Optoelectronic Devices - Pallab Bhattacharya, Pearson Education
7. Semiconductor Optoelectronics - Jasprit Singh, John Wiley
8. Optical Properties of Semiconductor Quantum Dots - V Woggon
9. Nonlinear Optics of Organic Molecules and Polymers - H S Nalwa, S Miyata
10. Sol-Gel for Photonics - B J Thompson
11. Practical Design and Production of Optical Thin Films - Marcel & Dekker
12. Coplanar Waveguide Circuits, Components and Systems - R N Simons

MWT 106: Microwave Passive Circuits

L T P: (3-0-0) **Credit: 3**

Unit 1: Thevenin's Theorem and its application in transmission line T and PI representation line. Analysis of two ports and multiports network matching using ZY Smith chart. (9 hrs)

Unit 2: Transmission matrix, S parameters, matching networks, reactive matching network using lumped elements, multi section transformer, quarter wave length transformer, lumped planar capacitor inductor, power divider, branch line coupler, hybrid ring coupler, directorial coupler. (11 hrs)

Unit 3: Analysis of these component using S parameter, Richards transformation, invertors, designs of microwave planar filters, delay lines and phase shifter. (10 hrs)

Unit 4: Microwave components like switches, filters, phase shifters and delay line based on MEMs technology. (10 hrs)

Reference Books:

1. Microwave Engineering Passive Circuits, Petter A. Rizzi, Prentice Hall.
2. Microwave Engineering : Non-reciprocal active and passive circuits, Joseph Helszajin, McGraw Hill.

Departmental Elective III

MWT 011: Microwave Active Circuits

L T P: (3-0-0) **Credit: 3**

Unit 1: Signal flow diagram, Equivalent circuit and models of microwave diode and transistors, S-parameters description of active devices. (10 hrs)

Unit 2: Classification of RF amplifiers for low noise, medium power and high power application, Biasing, stability and noise consideration, Matching consideration for maximum power and minimum reflection. (10 hrs)

Unit 3: Design of microwave amplifier circuits: broad band and narrow band amplifiers, broad band matching. (10 hrs)

Unit 4: Classification of microwave oscillators: characteristics and performance evaluation, Phase locked loop circuit, Basic mixer concept. (10 hrs)

Reference Books:

1. Microwave Engineering : Non-reciprocal active and passive circuits, JosephHelszajin, McGraw Hill.
2. Study and Application of Microwave Active Circuits with Negative Group Delay By Blaise Ravelo, Andre Perennec and Marc Le Roy

MWT 006: Computational Electromagnetic

L T P: (3-0-0) **Credit: 3**

Unit 1: Green's function, Finite difference methods: various finite difference schemes, finite differencing of PDEs. (10 hrs)

Unit 2: Accuracy and stability of FD solutions, application to transmission lines and waveguides. (9 hrs)

Unit 3: Finite Difference Time Domain (FDTD) method: Yee's FD algorithm, accuracy and stability, lattice truncation conditions, initial fields, programming aspects, absorbing boundary conditions for FDTD. (11 hrs)

Unit 4: Introduction to Method of Moments, application of FDTD and Method of moments to waveguides. (10 hrs)

Reference Books:

1. Numerical Techniques in Electromagnetics", 2nd Edition, M. Sadiku, CRC Press 2001 (available online:) (on reserve)
2. Analytical and Computational Methods in Electromagnetics", 1st Edition, R. Garg, Artech House, 2008 (on www.amazon.com).

MWT 007: Remote Sensing

L T P: (3-0-0) **Credit: 3**

Unit 1: Matter energy interactions, passive microwave radiometry. (9 hrs)

Unit 2: Imaging radar systems, remote sensors, communication and data transmission systems. (10 hrs)

Unit 3: Data processing and reprocessing, pattern recognition and classification, software systems, digital hardware. (11 hrs)

Unit 4: Fundamentals of image analysis-visible, thermal infra-red and microwave data , applications. (10 hrs)

Reference Books:

1. Microwave Remote Sensing: Active and Passive, Volume I: Microwave remote sensing fundamentals and radiometry by F. Ulaby, R. Moore, A. Fung Artech House, 1981, ISBN 0890061904
2. M.G. Srinivas(Edited by), Remote Sensing Applications, Narosa Publishing House, 2001.
3. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2001 (Units 3, 4 & 5).

Seminar MWT 251 **Credit: 2**

Project MWT 252 **Credit: 4**

Dissertation I MWT 253 **Credit: 8**

Dissertation II MWT 254 **Credit: 12**

Annexure-XXIV-B of Agenda Item no. 6.23

M.Tech.

in

Electronics and Communication Engineering
With specialization in
VLSI Technology

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2012-13)

Department of Electronics and Communication Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Electronics and Communication Engineering	
School:	School of Engineering and Technology	
Name of the Course:	M.Tech. in ECE with specialization in VLSI Technology	
Duration:	Two (02) years	
Total No. of Credits:	65	
Date of meeting of BOS:	July 12, 2012	
Members of BOS:	1. Prof. R. M. Mehra, HOD, ECE	Chairman
	2. Prof. H. M. Gupta, IIT Delhi	External Member
	3. Prof. Avinashi Kapoor, University of Delhi	External Member
	4. Dr. Rajeev Srivastava, ST Microelectronics	External Member
	5. Dr. Amitava Majumdar, Moser Baer India	External Member
	6. Mr. Sandeep Singh, Coordinator, ECE	Internal member
	7. Ms Rashmi Priyadarshini, ECE	Internal member
	8. Ms Noor e Zahra, ECE	Internal member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

COURSE STRUCTURE

M.Tech. in ECE with specialization in VLSI Technology, Sharda University

SEMESTER	Courses (L-T-P) Credits							LectureCourses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Advanced Computer Architecture (3-0-0) 3	Advance Digital design using HDL (3-1-0) 4	CMOS Digital VLSI Design, Testing and verification (3-0-0) 3	Departmental Elective 1 (3-0-0) 3	Departmental Elective 2 (3-0-0) 3	Foreign Language (1-0-2) 2	Practical Digital System Design Laboratory (or) Modelling Lab (0-0-4)2	**6**	**16**	**1**	**6**	**23**	**20**
II	Mobile and Wireless Communication (3-0-0) 3	Mixed Signal CMOS VLSI Design (3-0-0) 3	Advanced VLSI Design (3-0-0) 3	Departmental Elective 3 (3-0-0) 3	Open Elective (3-0-0) 3	Technical Communication (1-0-2) 2	Practical Physical Design Lab (or)Elecronics CAD Lab (0-0-4)2	**6**	**16**	**0**	**6**	**22**	**19**
III	Seminar (0-0-2)2	Project (0-0-4)4	Dissertation (0-0-15)8					-	-	-	-	-	14
IV	Dissertation (0-0-21)12							-	-	-	-	-	12

Total Credits – 65

Legends:

Foreign Language	: 02
Technical Communication	: 02
Departmental Core (DC)	: 19
Practicals	: 04
Departmental Elective (DE)	: 09
Open Elective (OE)	: 03
Seminar	: 02
Project	: 04
Dissertation (Semester III and IV)	: 20
TOTAL	**: 65**

LIST OF DEPARTMENTAL CORE

1. Advanced Computer Architecture MCS 103
2. Advance Digital design using HDL MVT 102
3. CMOS Digital VLSI Design, Testing and verification MVT 111
4. Mobile and Wireless Communication MWT 005
5. Mixed Signal CMOS VLSI Design MVT 112
6. Advanced VLSI Design MVT 113

LIST OF DEPARTMENTAL ELECTIVES

1. Nanoelectronics MVT 105
2. Biomedical Electronics MVT 001
3. Yield and Reliability Engineering MVT 002
4. Device Modelling and Circuit Simulation MVT 003
5. MEMS and IC Integration MVT 004
6. Advanced Digital Communications System MVT 005
7. ASIC/FPGA Design MVT 013
8. Advanced DSP MVT 006
9. Embedded Systems MVT 104

Seminar MVT 256
Project MVT 257
DissertationI MVT 258
DissertationII MVT 259

M.Tech.

in

Electronics and Communication Engineering

with specialization in

VLSI Technology

SYLLABI

Semester-I
(Departmental Core Subjects)

MCS 103: Advanced Computer Architecture

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(08)**

Parallel Computing, Parallel Computer Model, Program and Network Properties, Parallel Architectural Classification Schemes, Flynn's & Feng's Classification Performance Metrics and Measures, IEEE POSIX Threads, Thread Synchronization. Pipelining and Memory Hierarchy, Basic and Intermediate Concepts, Instruction Set Principle; ILP: Basics, Exploiting ILP, Limits on ILP.

UNIT 2: Cache memory **(08)**

Basic cache structure, Set associative caches, Evaluating Cache performances Determining Cache parameters, Replacement Policies, Implementing LRU, Replacement policies; Virtual Memory : Basic virtual memory structure, Translation lookaside buffer, Segment tables, Replacement algorithms, Detail example of a virtual memory system.

UNIT 3: Pipeline techniques **(08)**

Principles of Pipelined computers, Evaluating performance of pipelined, Computers, Reservation tables and collision vectors, Maximizing pipeline, Performance, Conditional branches in pipelined computers, Internal forwarding and deferred instructions.

UNIT 4: Multiprocessors **(08)**

Flynn's classification of multiprocessors, Vector computers, Numerical algorithms on a vector computer, Pipelining in vector computers, Examples of vector computers, e.g. Cray, Multiprocessor interconnections: General purpose multiprocessors, e.g. RP-1, HEP, Data flow computers.

UNIT 5: RISC computers **(08)**

Pipelined structure of the CPU, RISC characteristics. Case study of MIPS-64 processor

Text Books:

1. M. R. Bhujade, "Parallel Computing", Newage International Pvt. Ltd.
2. Stallings, William, "Computer organization and architecture, designing for performance", Prentice Hall of India.

Reference Books:

1. J. L. Hennessy and D. A. Patterson, "Computer architecture: a quantitative approach", Harcourt Asia, Singapore.
2. Richard Y. Kain, "Advanced Computer Architecture: a system Design approach", PHI.

MWT 102: Advance Digital System using HDL

L T P: 3-1-0 **Credit: 4**

UNIT 1: VHDL **(13)**

Origin of VHDL, VHDL basics, VHDL levels of abstraction, VHDL design flow, modeling hardware in VHDL,VHDL design entities, Entity declaration, Architecture, Using libraries and packages, concurrent signal assignments, signal assignments with delay.

Component declaration, component instantiation, named port mapping, positional port mapping, direct instantiation, Configuration specifications, entity binding, port modes, VHDL process, processes sensitivity lists, test benches.

Objects in VHDL, Constants, variable & signals, VHDL types, scalar types, Arrays, Records, Custom types and subtypes, Tristate and resolved types, std_ulogic and std_logic, unsigned and signed, attributes.

Concurrent statements, Sequential statements, Conditional & selective signal assignments, Generate statements, signal and variable assignments, synthesis of statements, latch inference, for loop.

UNIT 2: Simulation and Synthesis **(10)**

How a VHDL simulator works, Event driven simulation, Delta delay, transport delay, inertial delay, reject, Combinational logic in process, Synchronous(clocked) process, modeling of combinational digital circuit using VHDL: Basic gates like And,nor,xor etc multiplexor, encoder, decoder, half and full adder, half and full subtractor. Modeling of sequential circuit using VHDL: Flip flop, latches, syncronous and asynchronous Flip Flop, Syncronous and asynchronous counter, lodable up and down counter.

UNIT 3: Finite State Machine (FSMs) **(7)**

Review of Moore and Melay state machine, Finite state machines representation, use of enums to represent state like binary, gray, one hot assignment.FSM VHDL code structure, FSM example :Sequence detector for different sequence like 1101,1001 etc, FSM for counter, FSM for flip flop and VHDL coding, Synthesis of FSMs.

UNIT 4: Subprograms, Packages and Practical Exercise **(10)**

Subprograms, functions, procedures, Differences between functions and procedures, subprogram declarations, packages, package declaration, package body.

Configurable and Scalable Design: Generic parameters, generic mapping, Configuration declarations, default binding, Assertion.

Practical Exercise Undertaken during Course: Introduction to Mentor Graphics Modelsim or Aldec for VHDL simulation, Introduction to Xilinx ISE for synthesis & implemetation, VHDL simulation of all the basic gates, Multiplexor, encoder, decoder, half and full adder, subtractor, lodable 3-bit counter, VHDL simulation for Sequence detector.

Text Books:

1. J.Bhasker, " AVHDL Primer" Prentice Hall

Reference Book:

2. Peter J. Ashenden, " Designers guide to VHDL", Morgan Kaufman Publishers.
3. Charles H Roth Jr, "Digital System Design using VHDL", Thomson Learning, 2002

MVT 112: CMOS Digital VLSI Design, Testing and Verification

L T P: 3-0-0 **Credit: 3**

UNIT 1: MOS Transistors and Inverters (8)

MOS Transistor: I-V Characteristics, MOSFET Scaling and Small-Geometry Effects.
The MOS Inverter: Inverter principle, Depletion and enhancement load inverters, the basic CMOS inverter, transfer characteristics, logic threshold, Noise margins, and Dynamic behavior, Propagation Delay, Power Consumption.

UNIT 2: MOS Circuit Layout & Simulation (10)

MOS SPICE model, device characterization, Circuit Characterization interconnects simulation. MOS device layout: Transistor layout, Inverter layout, CMOS digital circuits' layout & simulation.

UNIT 3: MOS Design (10)

Static MOS design: Complementary MOS, Ratioed logic, Pass Transistor logic, complex logic circuits. Dynamic MOS design: Dynamic logic families and performances.
Sequential MOS Logic Design: Static latches; Flip flops & Registers, Dynamic Latches & Registers, CMOS Schmitt trigger, Monostable sequential Circuits, Astable Circuits.
Memory Design: ROM & RAM cells design.

UNIT 4: Testing and Verification (12)

Scope of testing and verification in VLSI design process, Issues in test and verification of complex chips, embedded cores and SOCs.
Testing: Fundamentals of VLSI testing Fault models. Automatic test pattern generation, Design for testability, Scan design, Test interface and boundary scan. System testing and test for SOCs. Delay fault testing. BIST for testing of logic and memories, Test automation,
Verification: Functional verification, Timing verification, Formal verification, Basics of equivalence checking and model checking.

Text Books:

1. M. Bushnell and V. D. Agrawal, "Essentials of Electronic Testing for Digital, Memory and Mixed-Signal VLSI Circuits", Kluwer Academic Publishers, 2000.
2. M. Abramovici, M. A. Breuer and A. D. Friedman, " Digital Systems Testing and Testable Design", IEEE Press, 1990.
3. T.Kropf, "Introduction to Formal Hardware Verification", Springer Verlag, 2000.
4. Weste, Eshraghian, "Principles of CMOS VLSI design", 2nd Edition Addison Wesley, 1994.
5. Douglas A Pucknell and Kamaran Eshragian, "Basic VLSI design ", 3rd edition, PHI, 1994.

(Departmental Elective)

MVT 105: Nanoelectronics

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(10)**

Nanoscale, Definition of nanotechnology; Consequences of the nanoscale for technology and society. Beyond Moore's Law. Nano-scale 1D to 3D structures; Technologies for the Nanoscale; Nano-scale fabrications; Nanomanipulation,. Nanolithography

UNIT 2: Introduction to Nano system **(10)**

Length energy and time scales, Top down approach to Nano lithography. Spatial resolution of optical, deep ultraviolet, X-ray, electron beam andion beam lithography. Single electron transistors, coulomb blockade effects in ultra small metallic tunnel junctions.

UNIT 3: Nanoscale Materials and Applications **(10)**

Nanocomposites; Nano-scale Electronics; Safety issues with nanoscale powders; Quantum wells, wires, dots and nanoparticles; Nano-scale bio and medical applications; Applications in energy, informatics, medicine, etc.

UNIT 4: Molecular Techniques **(10)**

Molecular Electronics, Chemical self assembly, carbon nano tubes, self assembled monolayers, Electomechanical techniques, Applications in biological and chemical detection, Atomic scales characterization techniques, scanning, tunneling microscopy,atomic force microscopy.

Text Books:

1. Beenaker and van Houten "Quantum Transport in Semiconductor Nanostructurenes in solid state Physics" Ehernereich and Turnbell, Academic press,1991
2. David Ferry" Transport in Nano structures" Cambridge University press 2000
3. Y.Imry "Introduction to Mesoscopic Physics, Oxford University press 1997
4. S.dutta "electron Transport in Mesoscopic system" Cambridge University press 1995

MVT 001: Biomedical Electronics

L T P: 3-0-0 **Credit: 3**

UNIT 1: Physiology and Transducers (10)

Cell and its structure – Action potential and resting potential, propagation of action potential , Sodium potassium pump ,Nervous system , CNS , PNS Nerve cell – Synapse , Cardio pulmonary system – Physiology of heart and lungs – Circulation and respiration – Biomedical Transducers – Different types – Piezo–electric, ultrasonic, resistive, capacitive, inductive transducers – Selection criteria.

UNIT 2: Electro-Physiological Measurements (10)

Basic components of a biomedical system – Electrodes – Micro, needle and surface electrodes – Amplifiers – Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier.ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms**.**

UNIT 3: Non-Electrical Parameter Measurements (10)

Measurement of blood pressure – Cardiac output – Cardiac rate – Heart sound – Respiratory rate – Gas volume – Flow rate of Co2, O2 in exhaust air - pH of blood, ESR, GSR measurements – Plethysmography.

UNIT 4: Medical Imaging and PMS (10)

X-ray machine - Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Electrical safety.

Pacemakers, Defibrillators , Ventilators , Nerve and muscle stimulators ,Diathermy ,Heart, Lung machine ,Audio meters ,Dializer

Text Books:

1. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, ‘Bio -Medical Instrumentation and Measurements’, II Edition, Pearson Education, 2002 / PHI.
2. R.S.Khandpur, ‘Handbook of Bio-Medical instrumentation’, Tata McGraw Hill Publishing Co Ltd., 2003.

MVT 002: Yield and Reliability Engineering

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(10)**

Mechanism of Yield loss in VLSI, Modeling of Yield loss mechanism, parametric and design problems, random point defects, Reliability fundamentals and bath tub curve, reliability measures and parameters, electronic system reliability, hazard rate model, probability concepts and failure time distribution.

UNIT 2: Reliability **(10)**

Device Reliability: Accelerated life testing, early life reliability, long term device reliability, electrostatic discharge, electrical stress, steady state hazard rate.

System Reliability: System reliability modeling, k-out of n system, analysis of complex reliability structures, system reliability estimation.

UNIT 3: Reliability Techniques **(10)**

Reliability prediction, cut set, tie set, FME set, PTA, Markovian Techniques, Monte Carlo Simulation, application to electronic systems.

UNIT 4: Maintainability and Availability **(10)**

Maintainability and availability concepts: Guidelines for design for maintainability, MITR, BIT/BITE facility, spares provisioning, electronics system packaging and interconnection.

Text Books:

1. Lewis, “Introduction to reliability engineering”, 2nd edition, Wiley international
2. O’Connor, P.D.T., “Practical reliability engineering”, Hayden Book Company

MVT 003: Device Modelling and Circuit Simulation

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction to IC Technology (7)

IC fabrication steps: Wafer preparation**,** Crystal growth techniques, wafer cleaning, Clean room and safety requirements. Oxidation: Kinetics of Silicon dioxide growth both for thick, thin and ultra thin films, Deal-Grove model, Diffusion and Ion Implantation: Diffusion process, Ion implantation, modeling of Ion implantation and its types, Deposition & Growth: Various deposition techniques CVD, PVD, MBE and their types, Etch and Cleaning: materials used in cleaning, various cleaning methods, Wet etch, Dry etch. Photolithography: Positive photo resist, negative photo resist, comparison of photo resists, need for masks and its types. : Planarization Techniques: Need for planarization, Chemical Mechanical Polishing, NMOS, CMOS and Bipolar fabrication process.

UNIT 2: SPICE, Junction Diode and BJT (10)

Introduction to SPICE: AC, DC, Transient, noise, temperature extra analysis.

Junction Diodes: DC, small signal, large signal, high frequency and noise models of diodes. Measurement of diode model-parameters.

BJT: DC, small signal, high frequency and noise models of bipolar junction transistors. Extraction of BJT model parameters.

UNIT 3: MOSFET, Device Scaling and MOS Models (10)

MOSFETs: DC, small signal, high frequency and noise models of MOSFETs. MOS Capacitors.

Device SCALING: short and narrow channel MOSFETs. MOSFET channel mobility model, DIBL, charge sharing and other non-linear effects.

MOS Models: Level-1 and level-2 large signal MOSFET models. Introduction to BSIM models. Extraction of MOSFET model parameters.

UNIT 4: HBT and Component model for IC (10)

HBTs: Principles of hetro junction devices, HBTs, HEMT

Component model for ICs: Design rule checks, timing verification, worst case delay simulation, setup and hold times for clocked devices, Behavior modeling, structural modeling, simulation with the physical model.

Text books:

1. S.M. Kang & Y. Leblibici, “CMOS Digital Integrated Circuits-Analysis & Design”, TMH, Ed. 2003
2. S.M. Sze, “Physics of semiconductor devices”, Wiley Pub.
3. S.M. Sze (Ed), VLSI Technology, 2nd Edition, McGraw Hill, 1988

Reference books:

1. Stephen Campbell, The Science and Engineering of Microelectronics, Oxford University Press, 1996
2. S.K. Ghandhi, VLSI Fabrication Principles, John Wiley Inc., New York, 1983.

MVT 004: MEMS and IC Integration

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction to MEMS (10)

Overview of CMOS process in IC fabrication, MEMS system-level design methodology, Equivalent Circuit representation of MEMS, signal-conditioning circuits, and sensor noise calculation.Pressure sensors with embedded electronics (Analog/Mixed signal): Accelerometer with transducer, Gyroscope, RF MEMS switch with electronics, Bolo meter design RF MEMS, and Optical MEMS.

UNIT 2: MEMS and Microsystems (8)

Typical MEMs and Microsystems, , materials for MEMS - active substrate materials- Silicon and its compounds, Silicon piezoresistors, Gallium Arsenide, quartz, polymers. Micromachining-photolithography, thin film deposition, doping, etching, bulk machining, wafer bonding, LIGA

UNIT 3: Microsensors and Acuators (10)

Mechanics for MEMs design- static bending of thin plates, mechanical vibration, thermomechanics, fracture and thin film mechanics. Mechanical sensors and actuators – beam and cantilever – microplates, strain, pressure and flow measurements, gyroscope, piezoactuator. Thermal sensors and actuators- micromachined thermocouple probe, Peltier effect heat pumps, thermal flow sensors.

UNIT 4: Microfluidic Systems (12)

Fluid dynamics, continuity equation, momentum equation, equation of motion, laminar flow in circular conduits, fluid flow in microconduits, in submicrometer and nanoscale. Microscale fluid, expression for liquid flow in a channel, fluid actuation methods, dielectriophoresis, microfluid dispenser, microneedle, micropumps-continuous flow system. Applications of BioMEMS: CAD for MEMs, Drug delivery, micro total analysis systems (MicroTAS) detection and measurement methods, microsystem approaches to polymerase chain reaction (PCR), DNA hybridization

Text Books:

1. Gregory T.A. Kovacs, Micromachined Transducers Sourecbook, The McGraw-Hill, Inc. 1998
2. Stephen D. Senturia, Microsystem Design, Kluar Publishers, 2001
3. Nadim Maluf, An Introduction to Microelectromechanical Systems Engineering, Artech House, 2000.
4. M.H. Bao, Micro Mechanical Transducers, Volume 8, Handbook of Sensors and Actuators, Elsevier, 2000.
5. Masood Tabib-Azar, Microactuators, Kluwer, 1998.

MVT 005: Advanced Digital Communications

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(10)**

Geometric representation of modulation signals, Linear modulation technique, $\pi/4$ QPSK, offset QPSK, Constant envelop technique, MSK, GMSK, Linear & Constant envelop modulation technique, M-ary PSK, M-ary QAM.

UNIT 2: Spectrum and Systems **(10)**

Spread spectrum system like DS-Spread spectrum, Pseudo noise sequences, Performance of DS-SS, Frequency Hopping systems, Modulation Error performance for Binary signal in AWGN, Detection of M-ary orthogonal, M-ary orthogonaling with non-coherent detection.

UNIT 3: Equalization **(10)**

Equalization: Adaptive equalizer, Linear Equalizer, Nonlinear Equalizer, ISI interference, RAKE receiver, Maximum likelihood sequence estimation (MLSE) equalizer.

UNIT 4: Fading Distributions and Speech System **(10)**

Railey fading distribution, Ricean fading distribution, Speech coding, Characterization of Speech signals, Vector quantization, Adaptive quantization, Power spectrum for general memory less modulation.

Text Books:

1. Proakis, J.G: Digital Communication, Mc Grawhill, 1995.
2. Stephen G.Wilson: Digital Modulation and Coding, Pearson Education (Singapore) pte. Ltd.
3. T.S Rappaport: Wireless Communications, Pearson Education (Singapore) pte. Ltd.
4. Hykin, S: Digital Communication, Wiley.

Semester-II
(Departmental Core Subjects)

MVT 114: Advanced VLSI Design

L T P: 3-0-0 **Credit: 3**

UNIT 1: VLSI Design **(10)**

VLSI Physical Design Automation: VLSI design cycle, physical design cycle, design styles and system packaging styles ,design rules, layout of basic devices, CMOS layout. Cell generation and Programmable structures, Transistor chaining, Partitioning: Problem formulation, classification of partitioning algorithms and performance driven partitioning. Placement, floor planning and pin assignment: Placement, floor planning, pin assignment, integrated approach.

UNIT 2: Global Routing **(8)**

Problem formulation classification of global routing algorithms, maze routing algorithms, line - probe algorithms, shortest path based algorithms, steiner tree based algorithms, and integer programming based approach.

UNIT 3: Supply voltage scaling approaches **(12)**

Parallelism, pipelining, using multiple supply voltage, unit level voltage selection, clustered voltage scaling, level converters, multiple supplies inside a block, MTCMOS circuits, level shifters, timing and power planning, choosing the high V_{TH} value, MTCMOS circuits using sleep transistors . supply voltage limitations, Optimum supply voltage, multiple device threshold, Technology level – feature size scaling, threshold voltage scaling, Transistor sizing for energy minimization, dynamic supply voltage scaling, dynamic threshold voltage scaling . Energy recovery, design with reversible logic, adiabatic logic, peripheral circuits, Dynamic voltage and frequency scaling.

UNIT 4: Switching and Gating **(10)**

Switching activity estimation in static and dynamic logic, signal statistics, intersignal correlations, Reducing switching capacitance through transistor sizing, logic and architecture optimization, layout techniques, logic restructuring, input ordering, data representation, resource allocation, reducing glitching through path balancing, clock gating . Power gating, signal isolation, state retention and restoration, architectural issues for power gating,
Behavioral level transforms, algorithm level transforms, architectural transformations, Operation reduction and substitution, logic level optimization and technology mapping,

Text Books:

1. Anantha Chandrakasan, Robert Brodersen, Low-power CMOS design, IEEE press, 1998
2. Kaushik Roy, Sharat C. Prasad, Low-power CMOS VLSI circuit design, John Wiley & Sons, 2000.
3. A.Bellamour, M.I.Elmasri, Low power VLSI CMOS circuit design, Kluwer Academic Press, 1995
4. Naveed Sherwani, “Algorithms for VLSI physical design automation”, Kluwer academic publisher – 1993.
5. Douglas A. Pucknell & Kamran Eshraghian, “Basic VLSI Design” Prentice-Hall of India.

MVT 113: Mixed Signal CMOS VLSI Design

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(10)**

Basic current mirrors and single stage amplifiers , simple CMOS current mirror, common source, common gate amplifier with current mirror active load , source follower with current mirror to supply bias current, Two stage CMOS operational amplifier, feedback and operational amplifier compensation, advanced current mirrors, folded-cascade operational amplifier, current mirror operational amplifier, fully differential operational amplifier, common mode feedback circuits, current feedback operational amplifier. Comparator, charge injection error, latched comparators.

UNIT 2: Sample and hold and switched capacitor circuits **(10)**

MOS, CMOS and BIMOS sample and hold circuits, switched capacitor circuits, basic operation and analysis first order, charge injection, switched capacitor gain circuit , correlated double sampling techniques, other switched capacitor circuits.

UNIT 3: Phase Lock Loop **(8)**

Basic PLL topology, dynamics of simple PLL, Multiplier, EXOR and JK–flipflop phase detectors, lock acquisition, Phase frequency detector, Loop filters, Charge Pump PLLs, non ideal effects in PLLs.

UNIT 4: Converters **(12)**

Data converter fundamentals , DC and dynamic specifications, quantization noise , Nyquist rate D/A converters, decoder based converters – binary scaled converters thermometer code converters , hybrid converters, Nyquist rate A/D converters-Successive approximation, Flash, interpolating, Folding, Pipelined, Time-interleaved converters

Oversampling converters, Noise shaping modulators, Decimating filters and interpolating filters, Higher order modulators, Delta Sigma modulators with multibit quantizes- Delta Sigma D/A

Text Books:

1. Behzad Razavi, Design of Analog CMOS Integrated Circuit, Tata-Mc GrawHill, 2002.
2. Rudy van de Plassche, CMOS integrated Analog- to Digital and Digital to- Analog converters, Kluwer academic publishers,2003.
3. David Johns, Ken Martin, Analog Integrated Circuit Design, John Wiley and Sons, 2001.
4. D.A. John and Ken Martin, “analog integrated circuit design”, John Wiley, 1st Edition, 1996.
5. Mohamed Ismail, “Analog VLSI”, Mc Graw hill, 1st Edition, 1994.

MWT 005: Mobile and Wireless Communication

L T P: (3-0-0) **Credit: 3**

UNIT 1: Wireless Transmission **(10)**
Frequencies, regulations, Signals, Antennas, Signal Propagation, path loss, Multi path and other effects.

UNIT 2: Multiplexing **(10)**
SDM, FDM, TDM, and CDMA Modulation Techniques: ASK, FSK, PSK, Multi-carrier and Spread Spectrum: their use in Mobile and Wireless Communication Systems.

UNIT 3: Access Control Mechanisms **(10)**
SDMA, FDMA, TDMA, CDMA and their performance evaluation.

UNIT 4: Wireless Networks **(10)**
Satellite networks, Wireless LAN, Wireless ATM. OSI, Mobile Network and transport layers, their protocols and implementation, Wireless Application Protocol.

Text Books:

1. T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.
2. W. Stallings, "Wireless Communications and Networks", Prentice Hall, 2002.
3. V.K. Garg, "IS-95 CDMA and CDMA 2000", Prentice Hall PTR, 2000.
4. Leon-Garcia and I. Widjaja, "Communication Networks, Fundamental Concepts and Key Architectures", McGraw-Hill, 2000.
5. J.Schiller,"Mobile Communications", Addison Wesley, 2000.
6. Fred Halsall, "Multimedia Communications, Applications, Networks, Protocols and Standards", Addison Wesley, 2001.
7. Uyless Black ,"Mobile and Wireless Networks" , Prentice Hall PTR, 1996.

(Departmental Electives)

MVT 013: ASIC/FPGA Design

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction **(10)**

Introduction to ASICS, CMOS LOGIC and ASIC Library Design, Types of ASICs, design flow, Data path logic cell, transistor parasitic capacitance, logical effort – library cell design,– library architecture.

UNIT 2: Programmable ASIC I **(10)**

Programmable ASICS, Programmable ASIC Logic cells and Programmable ASIC I/o cells Anti fuse- static RAM – EPROM and EEPROM technology, PREP benchmarks- Actel ACT-Xilinx LCA- Altera FLEX- Altera MAX DC & AC inputs and outputs – clock & Power inputs – Xilinx I/O blocks.

UNIT 3: Programmable ASIC **(5)**

Programmable ASIC Interconnect, Programmable ASIC design software and Low level design entry Actel ACT-Xilinx LCA, Xilinx EPLD, EDIF-CFI design representation.

UNIT 4: Synthesis, Simulation and Testing **(15)**

Logic Synthesis, Simulation and Testing Verilog and logic synthesis, types of simulation, boundary scan test- fault simulation automatic test pattern generation. ASIC construction, Floor Planning, Placement and routing System partition – FPGA partitioning – partitioning methods – floor planning – placement – physical design flow- global routing – detailed routing – special routing – circuit extraction – DRC.

Text Books:

1. M.J.S. Smith, “Application – specific integrated circuits” – Addison – Wesley Longman Inc. 1997.
2. Andrew Brown, - “VLSI circuits and systems in silicon”, Mc Graw Hill, 1991.
3. S.D. Brown, R.J. Francis, J.Rox, Z.G. Uranesic, “Field Programmable gate arrays”, Khuever academic publisher, 1992.
4. S.Y.Kung, H.J. Whilo House, T.Kailath, “VLSI and Modern Signal Processing”, Prentice Hall, 1985.

MVT 006: Advanced Digital Signal Processing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Discrete Fourier Transform (10)

Frequency Domain Sampling, The Discrete Fourier Transform Frequency-Domain Sampling and Reconstruction of Discrete-Time Signals. The Discrete Fourier Transform (DFT). The DFT as a linear Transformation. Relationship of the DFT to Other Transforms. Properties of the DFT. Periodicity, Linearity, and Symmetry Properties. Multiplication of two DFTs and Circular Convolution. Additional DFT Properties. Frequency analysis of signals using the DFT.

UNIT 2: Efficient Computation of the DFT (10)

FFT Algorithms, Direct Computation of the DFT. Radix-2 FFT algorithms. Efficient computation of the DFT of two real sequences, computations, efficient computation of the DFT of a 2NPoint real sequences, Gortezel Algorithm, Chirp Z-transform algorithm.

UNIT 3: Basic IIR Filter Structures and Multirate Signal Processing (10)

Direct forms (I & II), cascade and parallel realizations. Signal flow graph, Transposed structure, Basic FIR filter structures-. Direct form structure, frequency sampling structure, Lattice structure, Linear phase FIR structure. FIR structures. Symmetric and Anti-symmetric FIR Filters, Design of Linear-Phase FIR Filters Using Windows, Basic operations of multirate processing, Sampling rate conversions, Analysis and Synthesis of filter banks, Haar filters, Subband coding and Multiresolution Analysis, Discrete wavelet transform, Haar and Daubechies Wavelets.

UNIT 4: Adaptive Filters and Design of IIR Filters from Analog Filters (10)

Wiener filters, Newton Algorithm, Steepest-Descent algorithm, Least-Mean-Square algorithm, Recursive filters, IIR Filter Design by Approximation of Derivatives, IIR Filter Design by Impulse Invariance. IIR Filter Design by the Bilinear
Transformation. The Matched-z Transformation, Characteristics of Commonly Used Analog Filters. Application of above technique to the design of Butterworth & Chebyshev filters.

Text Books:

1. Sanjit K. Mitra, “Digital Signal Processing”, Third Edition, TMH, 2005
2. John G. Prokis & Dimitris G. Manolakis , “Digital Signal Processing”, PHI Publication
3. Oppenheim A.V. & Schafer, Ronald W., “Digital Signal Processing”, Pearson Education.
4. Rabiner, L.R. and Gold B., “Theory and applications of DSP”, PHI.
5. Andreas Antoniou, “Digital Signal Processing”, TMH, 2006

MVT 104: Embedded Systems

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction to Embedded system and Design Process (10)

Overview of processors and hardware units in an embedded system, Software embedded into the system, Exemplary embedded system, embedded system on a chip and the use of VLSI circuits.
Design Process: Requirement, specifications, Architecture design, Design of components, system integration.

UNIT 2: Embedded system Architecture (10)

Instruction Set Architecture, CISC and RISC instruction set architecture, Basic embedded processor/microcontroller architecture, CISC example: Motorola (68HC11), 8051architecture, CISC example: Motorola
(68HC11), 8051.RISC Example: ARM, DSP Processor, and Harvard Architecture-PIC.
Memory System Architecture-cashe, virtual memory, memory management unit and address translation.

UNIT 3: I/O Devices and Component Interfacing (10)

Devices I/O types and examples-Synchronous, Iso-synchronous and asynchronous communications from serial devices, Example of Internal serial-communication devices-UART and HDLC, Timer and counting devices,I2,USB,CAN and advanced I/O serial high speed buses.
Memory Interfacing, I/O devices interfacing, Interfacing protocol-GPIB, FIREWALL, USB, IRDA.

UNIT 4: Software Development and Tools and RTOS (10)

Embedded system evolution trends, round-robin, robin with interrupts, function – one scheduling architecture, algorithms, introduction to- assembler - compiler-cross compilers and integrated development environment (IDE). Object oriented interfacing, recursion, debugging strategies, simulators.
Real Time Operating System(RTOS):Definition of process **,**task and threads, clear cut distinction between functions, ISRs and tasks by their characteristics, operating system services, structures, kernel, process management, memory management, file system and organization and implementation, interrupt routine handling in RTOS,RTOS task scheduling models, cyclic scheduling with time slicing, interprocess communication and syncronisation, shared data problem, use semaphore, priority inversion problem and deadlock situations, inter process communications using signals, Message queues, mailboxes, pipes, virtual sockets, RPCs..

Text Books:

1. David E Simon, “An embedded software primer”, Pearson education Asia, 2001.
2. Rajkamal, Embedded system architecture, programming and design, TATA McGraw Hill.
3. Jonarthan W Valvano Brooks/code, “Embedded micro computer systems, Real time interfacing”, Thomson learning 2001.
4. Health, Steve, “Embedded Systems Design”, Newnes 1997.

MVT 153: MODELLING LAB

L T P: 0-0-4 **Credit: 2**

List of Experiments using VHDL

Simple Design exercises:

01 Half adder, Full adder, Subtractor Flip Flops, 4bit comparator.
02 Parity generator
03 Bit up/down counter with load able count
04 Decoder and encoder
05 8 bit shift register
06 8:1 multiplexer
07 Test bench for a full adder
08 Barrel shifter
09 N by m binary multiplier
10 RISC CPU (3bit opcode, 5bit address)

MVT 152: Electronics CAD Lab

L T P: 0-0-4 **Credit: 2**

List of Experiments

1. Design, Simulation and Analysis of following circuits using Circuit simulator:
    a. Push pull Amplifier.
    b. Differential Amplifier
    c. NMOS and CMOS inverter
    d. Two input NAND Gate
    e. Two input NOR Gate
2. Layout Design of NMOS and CMOS Inverter using Layout Generator
3. Layout Design of Two Input NAND Gate
4. Simulation of Full Adder using HDL
5. Chip Design using VHDL

MVT 151: Practical Digital System Design Laboratory

L T P: 0-0-4 **Credit: 2**

MVT 154: Practical Physical Design Lab

L T P: 0-0-4 **Credit: 2**

Seminar MVT 256 **Credit: 2**

Project MVT 257 **Credit: 4**

Dissertation I MVT 258 **Credit: 8**

Dissertation II MVT 259 **Credit: 12**

Annexure-XXIV-B of Agenda Item no. 6.23

M.Tech.

in

Electrical and Electronics Engineering with specialization in Power Systems

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Electrical and Electronics Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Electrical and Electronics Engineering	
School:	School of Engineering and Technology	
Name of the Course:	M. Tech. in Electrical and Electronics Engineering with specialization in Power Systems	
Duration:	Two years	
Total number of Credits:	68	
Date of Meeting of BOS:	July 12, 2012	
Members of BOS:	Prof. S.K. Bhattacharya, HOD	Chairman
	2. Prof. H. O. Gupta, Director, JIIT, Noida	Ext. Member
	3. Prof. Surekha Bhanot, BITS, Pilani	Ext. Member
	4. Prof. H.K. Verma, Dist. Professor	Int. Member
	5. Prof. J.D. Sharma, Dist. Professor	Int. Member
	6. Mr. S.P. Jaiswal, Asstt. Professor	Int. Member
	7. Mr. Vadhtya Jagan, Asstt. Professor	Int. Member
	8. Mr. C. Mohan, Asstt. Professor	Int. Member
	9. Ms. Soma Deb, Asstt. Professor	Spl. Invitee
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

COURSE STRUCTURE

M.Tech. in Electrical and Electronics Engineering with specialization in Power Systems

SEMESTER	Courses (L-T-P)							Lecture Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Modelling & Analysis of Power System (3-1-0) 4	Extra High Voltage Transmission (3-0-0) 3	Power System Reliability Assessment (3-1-0) 4	Departmental Elective-1 (3-0-0) 3	Optimization Techniques in Engineering (3-1-0)4	Foreign Language (1-0-2) 2	Power System Modelling & Simulation Lab (0-0-4)2	**6**	**16**	**3**	**6**	**25**	**22**
II	Power Systems Operation & Control (3-1-0) 4	Digital Protection of Power System (3-0-0) 3	Departmental Elective-2 (3-0-0) 3	Departmental Elective-3 (3-0-0) 3	Open Elective (3-0-0) 3	Technical Communication (1-0-2)2	Power system control and Protection Lab (0-0-4)2	**6**	**16**	**1**	**6**	**23**	**20**
III	Seminar (0-0-2)2	Project (0-0-4) 4	Dissertation (0-0-15) 8					**0**	**0**	**0**	**21**	**21**	**14**
IV	Dissertation (0-0-21) 12							**0**	**0**	**0**	**21**	**21**	**12**

Total Credits- 68

LIST OF DEPARTMENTAL ELECTIVES

1. Power Electronics and Convertors
2. Electric Drives systems
3. Artificial Intelligence for Power Systems
4. FACTS Devices and Systems
5. Renewable Energy Systems
6. Smart Grid
7. Distribution System Analysis & Operation
8. Power System Deregulation
9. Power System Dynamics
10. Power Quality
11. Distributed Generation
12. Substation Automation
13. Embedded Systems
14. Telemetry & SCADA
15. Advanced DSP
16. Power Systems Instrumentation

LIST OF OPEN ELECTIVES

1. Energy Managements and Energy Efficient Technology

M.Tech.

in

Electrical and Electronics Engineering

with specialization in

Power Systems

SYLLABI

MPS 114: Modelling & Analysis of Power System

L T P: 3-1-0 **Credit: 4**

1082

UNIT 1: Sparsity Techniques:

(4)

Storage of sparse matrix, sparsity directed inversion methods and parallel inversions.

UNIT 2: Three-Phase Load Flow:

(8)

Three-phase models of synchronous generator, transformer and load, load flow equations; solution techniques- Gauss-Seidel, Newton Raphson method and fast decoupled method.

UNIT 3: Load Flow with HVDC link:

(12)

DC system model, incorporation of control equations, inverter operation, unified and sequential solution techniques

UNIT 4: Short Circuit Studies For Unbalanced Network:

(8)

Z-bus building algorithm, derivation of fault admittance matrices, sequence components, analysis of unbalance shunt, series and open circuit faults.

UNIT 5: State Estimation:

(8)

State estimation of linear and nonlinear systems, pseudo-measurements, recursive method and weighted least square estimation method, detection and identification of bad measurements, network observability.

Reference Books:

1. Arrillaga J. and Arnold C.P., " Computer Analysis of Power Systems", John Wiley & Sons, 1990.
2. Kusic G.L., "Computer Aided Power System Analysis", CRC Press, 2008
3. P.M. Anderson, "Analysis of Faulted Power Systems", Wiley-IEEE Press 1995.
4. Abur A. and Exposito A. G., "Power System State Estimation: Theory & Implementation", Marcel Dekkar, 2004
5. Das J, "Power System Analysis: Short-Circuit Load Flow and Harmonics", CRC Press, 2011.
6. Singh L.P., "Advanced Power System Analysis and Dynamics", New Age International, 2006.

MPS 115: Extra High Voltage Transmission

L T P: 3-1-0 **Credit: 4**

UNIT 1: **Introduction:**

(3)

Problems of EHV transmission, calculation of impedance and capacitance matrices of 3-phase transmission line

UNIT 2: Computation of over voltages:

(8) Causes of over voltages, voltage and current transients, methods for calculation of over voltages, frequency domain & time domain modelling of 1-phase and 3-phase transmission lines.

UNIT 3 : Protection against over voltages:

(4) Methods of protection against switching surges, means of protection against lightning surges, shielding methods, design parameters and methods.

UNIT 4 : Design of Transmission Lines:

(6) Selection of transmission line parameters, calculation of corona current/loss, radio interference, audible noise interference and various types of clearances

UNIT 5 : Series and Shunt Compensation:

(6) Effect of series capacitors, location of series capacitors, sub-synchronous resonance in series-capacitor compensated transmission lines, Shunt compensation- conventional devices, static VAR compensation: TCR-FC, TCR, TSC-TCR devices.

UNIT 6: Design of Substations:

(8) Types of substations, layout of substation, bus bar arrangements, grounding system- types of grounding, design parameters, designing a grounding grid, measurement of soil resistivity,

UNIT 7: HVDC systems:

(5) Types of HVDC systems, terminal equipment and their operations, dc link control and protection.

Reference Books:

1.Begamudre R.D., “Extra High Voltage Transmission Engineering”, New Age International(P) Ltd, New Delhi, 2003

2.Kundur P., “Power System Stability and Control”, 2nd Ed., Tata-McGraw Hill, New Delhi, 2008

3. Meliopoulas, A.P.S., “Power System Grounding and Transients”, Marcel Dekker Inc, New York, 1988

4. Arrillaga J. and Watson N.R., “ Computer Modelling of Electrical Power Systems, John Wiley & Sons, 2003.

5. Padiyar K.R., “HVDC Power Transmission Systems”, New Age International, 2005

"Transmission Line Reference Book, 345 kV and Above", EPRI, 1982
6. Kiessling F., Nefzger P., Nolasco J.F. and Kaintzyk U., "Overhead Power Lines: Planning, Design, Construction", Springer, 2003

MPS 116: Power System Reliability Assessment

L T P: 3-1-0 **Credit: 4**

UNIT 1: Review of Probability Theory:

(5)

Probability concepts, rules for combining probability, probability distributions, random variables, density and distribution functions, mathematical expectations, variance and standard deviation.

UNIT 2 : Basic Reliability Evaluation:

(10) General reliability functions, probability distributions in reliability evaluation, network modelling and evaluation of series, parallel, series –parallel and complex systems, cut-set method, tie-set method, discrete Markov chains, continuous Markov process, frequency and duration technique concepts, application to multi-state problems, approximate system reliability evaluation methods.

UNIT 3: Generation System Reliability:

(10) Generation system models, capacity outage table, recursive algorithm, loss of load indices, inclusion of scheduled outages, load forecast uncertainty, loss of energy indices, expected energy generation, energy limited systems, Gram-Charlier series and its application to generation system reliability evaluation, frequency and duration method.

UNIT 4: Interconnected System:

(5) Probability array method in two inter-connected systems, effect of tie capacity, tie reliability and number of tie lines, equivalent assistance unit method for reliability evaluation of inter-connected system, elementary concepts for reliability evaluation of multi-connected systems.

UNIT 5: Distribution System Reliability:

(10) Basic technique and application to radial systems, customer–oriented indices, load and energy indices, effect of lateral distributor protection, effect of disconnects, effect of protection failures, effect of load transfer, meshed and parallel networks, approximate methods, failure modes and effects analysis, inclusion of scheduled maintenance, temporary and transient failures, inclusion of weather effects.

Reference Books:

1.Billinton R. and Allan R.N., "Reliability Evaluation of Power Systems", Pitman Advanced Publishing Program, 1984
2.Billinton R. and Allan R.N., "Reliability Evaluation of Engineering Systems Concepts and Techniques", Pitman Advanced Publishing Program, 1983
3. Endrenyi J., "Reliability Modeling in Electric Power Systems", John Wiley & Sons, 1978

4.Chowdhury A. and Koval D., “Power Distribution System Reliability”, John Wiley & Sons, 2009

Optimization Techniques in Engineering

L T P: 3-1-0 **Credit: 4**

UNIT 1: Algebraic Equations:

(5)

Iterative methods for solving linear and nonlinear equations.

UNIT 2: Differential Equations:

(4)

Finite difference method ,Euler and Runge-Kutta methods.

UNIT 3: Optimization problems:

(5)

Types of optimization problems, feasible region, necessary and sufficient optimality conditions.

UNIT 4: Unconstrained Optimization Techniques:

(6)

Direct Search and gradient based methods.

UNIT 5: Constrained Optimization Methods:

(8)

Linear and quadratic programming methods, penalty function, Lagrange multiplier and gradient projection methods.

UNIT 6: Evolutionary Techniques:

(5)

Genetic algorithm, particle swarm and ant colony optimization methods.

UNIT 7: Integer Programming:

(4)

Branch and bound method and cutting plane method.

UNIT 8: Case Studies

(3)

Reference Books:

1.Balagurusamy, E., “Numerical Methods “, Tata McGraw-Hill, 1999
2. Rao S.S, “Applied Numerical Methods for Engineers and Scientists”, Pearson Education, 2001
3.Rao S.S., “Engineering Optimization: Theory and Practice”, Wiley Eastern, 2009
4.Burden R.L. anf Faires J.D., “Numerical Analysis”, Brooks/Cole, 9th Edition, 2011
5.Song Y.H., “Modern Optimization Techniques in Power Systems”, Kluwer Academic, 1988

6.Deep K. and Chandra Mohan, Optimization Techniques", New Age International Publication, 2009
7.Deb K., "Optimization for Engineering Design: Algorithms and Examples", PHI Learning, 2004

MPS 118:Digital Protection of Power System

L T P: 3-0-0 **Credit: 3**

UNIT 1: Digital Relay Architecture:
(6)
Single input, two input, multii input protective relays, architecture and elements of a digital relay, input and output circuits, multiplexer & a-to-d converter, digital filters

UNIT 2: Digital Signal Processing:
(6)
Digital signal processing, fundamentals of fourier transformation, walsh & harr transform,data acquisition & processing, data communication**.**

UNIT 3: Communication:
(5)
Digital communication, data network protocols.

UNIT 4: Digital Protection of Generators:
(5)
Digital protection, other protective functions, protection algorithms.

UNIT 5: Digital Protection of Transformers :
(5)
Differential protection and harmonic restraint,protection algorithms.

UNIT 6: Digital Protection of Lines :
(6)
Differential equation based and dft based protection techniques, protection algorithms**.**

UNIT 7: Advanced Digital Relays:
(7)
Travelling wave based line protection relays, multi function relays, management relays.

Reference Books:
1. Phadke A. G. and Thorp J. S., "Computer Relaying For Power Systems", John Wiley, 2009

2. Johns A. T. & Salman S. K., “Digital Protection for power system”, Peter Peregrims, 1995
3. Christopoules C. & Wright A., “Electric Power System Protection” ,Kluwer Academic, 1999.

MPS 117: Power Systems Operation and Control

L T P: 3-1-0 **Credit: 4**

UNIT 1: Unit Commitment:

(6)

Unit Commitment problem, startup and shutdown cost, thermal unit constraints, hydro-constraints and other constraints, solution methods-priority-list and dynamic programming.

UNIT 2: Economic Dispatch of Thermal Units:

(8)

Economic dispatch problem with and without line losses, solution methods-lambda-iteration technique, gradient search and Newton’s method, optimal power flow method.

UNIT 3: Hydro-Thermal coordination:

(6)

Long term and short-term hydro-thermal scheduling problem, solution by gradient method, pumped storage hydro-plant scheduling.

UNIT 4: Power System Security:

(5)

System state classification, security analysis, contingency analysis methods, contingency selection

UNIT 5: Load Frequency Control:

(10) Generator model, load model, prime-mover model, governor model, tie-line model, automatic generation control of single area, inter-connected areas, steady state and dynamic analysis, two-area load frequency control

UNIT 6 : Excitation Control:

(5) Types of excitation control , reactive power and voltage collapse, factors affecting voltage stability, reactive power compensation methods

Reference Books:

1.Wood A. J., and Wollenberg B.F., "Power Generation Operation and Control", Second Edition, John Wiley and Sons, New York, 2003

2.Nagrath I.J. and Kothari D. P," Power System Engineering", Tata Mcgraw Hill, New Delhi, 2007

3. Miller T. J. E.," Reactive Power Control in Electric System", Wiley India,2010

4. Miller R.H. and Malinowski J.H., "Power System Operation", McGraw-Hill, 1994

MPS 001: Power Electronics and Convertors

L T P: 3-0-0 **Credit: 3**

UNIT 1: Review of Semiconductor Devices:

(10)

Review of the thyristors, triac, GTO, MOSFET and other power devices (IGBT, SIT, SITCH, MCT), characteristic ratings, series and parallel operation of the devices .

UNIT 2: Phase Controlled Converters:

(10)

Single and three-phase full wave controlled converters using R and RL loads, Dual Converter mode of operation- circulating and non-circulating current modes.

UNIT 3: Review of Choppers:

(10)

Types of chopper circuits, multi quadrant and multi-phase choppers, voltage and current commutated choppers and thyristor commutation circuits.

UNIT 4: AC Converter:

(10)

AC voltage controller and cycloconverters, harmonic reduction techniques, PWM inverters, current source inverters, power factor improvement techniques.

Reference Books:

1.Bose B.K., "Power electronics and AC drives", Prentice Hall, 1986

2.Rashid M.D., " Power electronics", Prentice Hall, 1993

3.Sen P.C., "Power electronics", Tata Mc.Graw Hill, 1987.

4. M.D. Singh, K.B. Kanchan Dani, ‘‘Power Electronics’’, Tata McGraw-Hill, 2007.
5. B.K. Bose, ‘‘Power Electronics and AC drives’’, Prentice Hall, 1986
6. G.K. Dubey, ‘‘Thyristorised Power Controllers’’, New Age International Publishers, 2005
7. S. Sivanagaraju, ‘‘ Power Semiconductor Drives’’, PHI, 2009

MPS 002: Electric Drives Systems

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction to Electrical Drives:

(10) Electrical drives- advantages of electrical drives, parts of electrical drives; electrical motors, power modulators, sources, control unit, classification of drives, dynamics of motor-load system, components of load torques, nature and classification of load torque.

UNIT 2: Selection of Motor Rating:

(8) Thermal model of motor for heating and cooling, classes of motor duty, motor ratings for different duty cycles.

UNIT 3 : Solid state control of DC motor converters:

(10) Motor performance parameters, supply performance parameters, single phase semi converter fed separately DC motor, fully controlled converter fed DC drive with continuous and discontinuous current conduction, performance numerical analysis and analytical performance, converter fed DC series motor with continuous and discontinuous conduction.

UNIT 4: Dual converter fed DC drive:

(12) Non-simultaneous control and simultaneous control mode, chopper fed DC drive, types of chopper, DC series motor drive, closed loop control- current limit control and inner current control loop, stability analysis.

Reference Books:

1. Dubey G.K., '' Fundamentals of Electric Drives'', Prentice Hall,1989
2. Sen P.C., ''Thyristor D.C Drives'', John Wiley & sons, 1981
3.Pillai S.K., ''A First Course in Electric Drives'', New Age International Publishers, 2007
4.Ned M., ''Power Electronics Converters Applications and Design'', John wiley & sons, 2007.
5. Dubey G.K., ''Power Semi Conductor Controlled Drives'', Prentice Hall,1989
6. Murphy F.N.D. and Turnable F.G., ''Power Electronic Control of an AC Motors'' ,Prentice Hall, 1988.
7. Sivanagaraju S., ''Power Semiconductor Drives'' ,PHI, 2009
8. Finney D., ''Variable Frequency AC Motor Drive Systems'', Peter Peregrinus Ltd, 1988.
9. Krishnan R., ''Electric Motor Drives Modelling Analysis and Control'', Prentice Hall, 2001

MPS 003: Artificial Intelligence for Power Systems

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction to AI: (9)

Definition, applications, components of an AI program, production system, problem characteristics. overview of searching techniques, knowledge representation, knowledge representation issues; and overview, representing knowledge using rules, procedural versus declarative knowledge, logic programming, forward versus backward reasoning, matching, control knowledge.

UNIT 2: Statistical Reasoning: (8)

Probability and bayes' theorem, certainty factor and rule based systems,bayesian networks, dampster shafer theorem, semantic nets and frames, scripts, examples of knowledge based systems.

UNIT 3: Pattern Recognition: (8)

Automatic pattern recognition scheme, design concepts, methodologies, concepts of classifier, concept of feature selection, feature selection based on means and covariance, statistical classifier design algorithms, increment-correction and lmse algorithms, applications in power systems.

UNIT 4: Artificial Neural Networks: (10)

Biological neuron, neural net, use of neural nets, applications, perception, single layer and multilayer neural nets, back propagation method, hopfield nets, supervised and unsupervised learning ,application in load forecasting and scheduling.

UNIT 5: Expert Systems: (5)
Study of some popular expert systems, expert system building tools and shells, design of expert systems, application in power systems.

Reference books:
1. Warwick K., Ekwue A. and Aggarwal R., "Artificial Intelligence Techniques in Power Systems", IEE, London. 1996.
2. Bart K "Neural Networks and Fuzzy Systems", Prentice Hall of India, 1994.
3. Dillon T. S. and Laughtonm M. A "Expert System Applications in Power Systems", Prentice Hall International, 1995.
4. Rajasekaran.S and.Pai .G.A.V" Neural Networks, Fuzzy Logic & Genetic Algorithms", PHI, New Delhi, 2003
5. Dan W. Patterson "Introduction to artificial intelligence and expert system", Prentice Hall of India Pvt.Ltd., , 2004.

MPS 004: FACTS Devices and Systems

L T P: 3-0-0 **Credit: 3**

UNIT 1: Power transmission control:
(6)
Power flow control, steady state and dynamic limits of power transmission, transmission line compensation, objectives of FACTS devices.

UNIT 2: FACTS Controller: (6)
Shunt connected controllers, series connected controllers, combined shunt and series connected controllers, voltage-source converters.

UNIT 3: Shunt Compensation:
(6)
Principal of operation and configuration of SVC, and STATCOM, V-I and V-Q characteristics, operation with unbalanced system, applications

UNIT 4: Series Compensation:
(6)
Principal of operation and configuration of TCSC and SSSC.

UNIT 5: Unified power flow controller:
(6)
Basic operating principles and characteristics of UPFC, dynamic performance, steady state analysis and control

UNIT 6: Stability analysis:
(10)
Oscillation stability analysis, transient stability control, protection issues with FACTS device.

Reference Books:

1. Hingorani N. G. and Gyugi L., "Understanding FACTS: concepts and technology of Flexible AC Transmission systems", Wiley IEEE Press, 1999
2.Acha E., Fuerta-Esquivel C. R., Ambriz-Perez H. and Angeles-Camacho C., "FACTS modeling and simulation in power networks", John Wiley & Sons Ltd., England, 2004
3.Song Y. H. and Johns A. T, "Flexible AC Transmission Systems", IEE Power Series, IET, 2000
4.Mathur R.M. and Verma R.K., "Thyrister Based FACTS Controller for Electric Transmission System", Wiley Interscience, 2002

OEL 017 Renewable Energy Systems

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction :
(3)
Energy reserves and estimates, global energy scenario, environmental, social and economic impact of renewable energy use.

UNIT 2 : Solar Energy:
(8)
Solar energy applications, availability of Solar radiation energy, solar thermal systems, solar photovoltaics -basic PV operation, PV technologies, electrical characteristics, interfacing technology.

UNIT 3: Wind Energy:
(8)
Wind resource assessment and modeling, types of wind turbines, performance assessment, control and electrical aspects.

UNIT 4: Water Power:
(8)
Hydropower power equation, large and small hydro, hydro turbines, control and electrical aspects.

UNIT 5: Biomass Energy:
(8)
Biomass as a source of energy, biogas–its generation and utilization for thermal and electricity generation

UNIT 6: Other Sources:
(5)
Geothermal energy, hydrogen energy, fuel cells, wave energy and tidal power.

Reference Books:
1.William k.H., "The Renewable Energy Handbook: A guide to rural energy independence, off-grid and sustainable energy", Aztext Press, 2003
2. Sorensen B., "Renewable Energy", Elsevier, 2004
3. Duffie, John A. & William A. B.," Solar Engineering of Thermal Process", John Wiley, 2006
4. Wereko B., Charles Y. H., and Essel B. "Biomass and Technology", John Wiley, New York, 1996
5. Clare R.," Tidal Power: Trends and Development", Thomas Telford, London, 1992

MPS 005: Smart Grid

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction:
(6)
Structure of smart grid, smart grid components, characteristics of smart grid, advantages of smart grid, features of smart grid.

UNIT 2: Smart Metering:
(8)
Smart metering, benefits of smart meters, functions of smart meters, smart metering techniques.

UNIT 3: Power Line Communication:
(8)
Power line communication, advantages of plc, echo model, src model, noises in power line communications and filter circuits to eliminate the noises.

UNIT 4: Smart Sensors:
(8)
An overview of smart sensors, functions of smart sensors, optical sensors, infrared detector arrays, accelerometer, integrated multisensor.

UNIT 5: Phasor measurement Unit:
(10)
Synchrophasor, operation of PMU, basic architecture of PMU, overview of the functions of PMU, wide area monitoring system using PMU, wide area control system using PMU, voltage stability enhancement and state estimation using PMU, requirements of PMU.

Reference Books:
1. Quentin W., "Smart Grid", Willey Publication, 2012
2. Mohammed E, "Smart Grid, Fundamentals of Design and Analysis", Willey Publication2nd edition, 2012
3. Andress C., Cooper J., " The Advanced Smart Grid" ,Artech House, 2011
4. Halid H., Abdelfatteh H., Ralf L., "Broadband Power Line Communications Network Design", Wiley Publication. 3rd edition, 2004
5. Gerard M., " Smart Sensor Systems", Willey Publication,2nd edition, 2008
6. Randy F., "Understanding Smart Sensors", Willey Publication, 2nd edition, 2010

MPS 006: Distribution System Analysis and Operation

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction:
(6)
Overhead and underground distribution systems, distribution system modelling, modelling of feeders, cables, transformers, capacitors, sectionalizes.

UNIT 2: Load flow analysis:
(10)
Distribution system load flow for balanced and unbalanced systems radial and weakly meshed systems (with and without PV buses), voltage regulation, regulators, line drop compensation, calculation of losses.

UNIT 3: Short circuit analysis:
(8)
General fault characteristics, fault calculations, high impedance faults, short circuit protection, State estimation of distribution systems.

UNIT 4: Distribution system reliability:
(8)
Customer based and load based indices, methods for improving reliability control of distribution systems, distribution system management, real time control, communication system for control and automation.

UNIT 5: Protection and interconnection:
(8)
Distribution system protection, single phase protective devices, distributed generation integration, modelling of distributed generation, islanding issues, quality impact.

Reference Books:
1. Short T.A., "Electric Power Distribution Handbook", CRC Press, 2003.
2.J. Northcote G. and Wilson R. G., "Control and Automation of Electric Power Distribution Systems", Taylor & Francis ,2007
3. Brown R.E., "Electric Power Distribution Reliability", CRC Press, 2009
4. Kersting W. H., "Distribution system modeling and analysis", CRC Press, 2002

EEE 009: Power System Deregulation

L T P: 3-0-0 **Credit: 3**

UNIT 1: Power System Restructuring:
(8)
Unbundling of power sector, market regulation, connection and use of system charges, traditional central utility model, independent system operator (ISO), retail electric providers.

UNIT 2: Power Sector Market:

(10)

Wholesale electricity markets, characteristics, bidding, market clearing and pricing, ISO models, market power evaluation, demand side management.

UNIT 3: Transmission System Operation:

(12)

Role of the transmission provider, multilateral transaction model, power exchange and ISO - functions and responsibilities, classification of ISO types, trading arrangements, power pool, pool and bilateral contracts, multilateral trades.

UNIT 4: Transmission Pricing:

(10)

Transmission pricing in open access system, marginal pricing methods, zonal pricing, embedded cost recovery, open transmission system operation, and congestion management in open access transmission systems in normal operation.

Reference Books:

1. Loi L. L., "Power System Restructuring and Deregulation – Trading, Performance and Information Technology", John Wiley & Sons, 2003
2. Bhattacharya K., Bollen M.H.J and Daalder J.E., "Operation of Restructured Power Systems", Kluwer Academic Publisher, 2001
3.Fred C. S., Michael C. C., Richard D. T. and Roger E. B., "Spot Pricing of Electricity", Kluwer Academic Publishers, 1988
4. Marija I., Francisco G. and Lester F., "Power Systems Restructuring: Engineering and Economics", Kluwer Academic Publishers, 1998

EEE 008: Power System Dynamics

L T P: 3-0-0 **Credit: 3**

UNIT 1: Modelling of Synchronous machines:

(10)

Flux linkage equations, voltage equations and equivalent circuit, real and reactive power control, Transient and sub transient effects, reactance and time constants of synchronous machines,characteristics under steady state and transient conditions.

UNIT 2: Steady State and Dynamic Stabilities:
(10)
Development of swing equation, linearization of swing equation. Steady state stability of single machine connected to an infinite bus and two machine systems. Coherent and non-coherent machines, dynamic stability of power system, classical model of multi machine system.

UNIT 3 Multi Machine Transient Stability:
(8)
Numerical methods for solution of differential equations, Transient stability studies using modified Euler method and Runge – kutta fourth order method.

UNIT 4: Stability and Control:
(12)
Factors affecting steady state and transient stabilities, methods of improving steady state, dynamic and transient stabilities, series capacitor compensation of lines, excitation control, power stabilizing signals, High speed circuit breaker, auto – reclosing circuit breaker, single pole and selective pole operation, by pass valuing and Dynamic braking.

Reference Book :
1.Nagrath IJ, Kothari D.P., "Power System Engineering", Tata Mc-Graw Hills, New Delhi 1994
2.PrabhaKundur, "Power system stability and control", Mc-Graw Hill Inc, New York, 1993
3.Taylor C.W., "Power System Voltage Stability", Mc-Graw Hill Inc, New York, 1993.
4.Elgerd O.I., "Electric Energy Systems Theory", TMH, New Delhi, Second Edition 1983.
5.Murthy P.S.R., "Power System Operation and Control", Tata Mc-Graw Hill, New Delhi 1984.

EEE 007: Power Quality

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction to Power Quality:
(6)

Terms and definitions, overloading, under voltage, sustained interruption, sags and swells, waveform distortion, total harmonic distortion (THD), computer business equipment manufacturers associations (CBEMA) curve.

UNIT 2 : Voltage Sags and Interruptions:
(6)
Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT 3: Overvoltage:
(10)
Sources of overvoltages, capacitor switching, lightning, ferro resonance, mitigation of voltage swells, surge arresters, low pass filters, power conditioners, lightning protection, shielding, line arresters, protection of transformers and cables, computer analysis tools for transients, PSCAD and EMTP.

UNIT 4: Harmonics:
(10)
Harmonic distortion, voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT 5: Power Quality Monitoring:
(8)
Monitoring considerations, Power line disturbance analyzer, power quality measurement equipment, harmonic / spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

Reference Books:
1. Roger.C.D., Mark.F.M., Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill, 2003
2.Arrillaga J.,Simith B.C. ,Watson N.R. and Wood A.R. "Power System Harmonics Analysis" John Willey &Sons 1997
3. Wakipen G.J., "Power System Harmonics : Fundamentals ,Analysis and Filter design" Springer,2001
4. Shankran C., "Power Quqlity" CRC Press. 2001

MPS 007: Distributed Generation

L T P: 3-0-0 **Credit: 3**

UNIT 1: DG Definitions and Standards:

(4)

DG potential, definitions and terminologies, current status and future trends, technical and economical impacts.

UNIT 2: DG Technologies:

(4)

DG from renewable energy sources, DG from non-renewable energy sources.

UNIT 3: Distributed Generation Applications and Operating Modes:

(8)

Base load, peaking, peak shaving and emergency power, isolated, momentary parallel and grid connection.

UNIT 4: DG Interconnection:

(10)

Characteristics of DG interface-rotating machines, characteristics of DG interface- static power converters, general protection requirement, effect of transformer connections.

UNIT 5: Power Quality Issues:

(8)

Reliability, voltage regulation, harmonics from DG, improving distribution system, PQ via the DG interface, improving reliability with DG, adverse impacts of DG on utility reliability.

UNIT 6: Protection Issues:

(6)

Islanding, utility issues, protective relays coordination, islanding prevention techniques safety of personnel; utility-generator load match frequency; utility re-closing; synchronizing

Reference Books:

1.Dugan, M. M., Santoso S. and Beaty H., Electrical Power System Quality, Second Edition, McGraw-Hill, 2002

2. Jenkins N., Allan R., Crossley P., Kirschen D. and Strbac G., "Embedded Generation", The Institute of Electrical Engineering, 2000

3. Acha E., Agelidis V., Anaya O.L. and Miller T.J., Power Electronics Control in Electrical Systems, Newnes Publication , 2002

MPS 008: Substation Automation

L T P: 3-0-0 **Credit: 3**

UNIT 1: Power System Automation:

(5) Basic theory, cost justification, risks/benefits- hard and soft.

UNIT 2: Digital Communications:

(8) Basic communication theory, encoding, modulation, error handling, communication media, digital multiplexing, Hierarchical/bus/star/ring configurations.

UNIT 3: Enterprise Communication:

(5) LAN/WAN integration, hubs, routers, gateways, network, management and security.

UNIT 4: Communication Protocol:

(6) DNP, MODBUS, PROFIBUS, IEC 60870-5, Ethernet, TCP/IP.

UNIT 5: Automation Architecture:

(16) SCADA system- hardware, software, data acquisition, control and features; RTU; PLC; IED; types of architecture; equipment monitoring for reliability and safety, utility integration of communication & control, and protection, wide-area measurement system, synchronized phasor measurements, adaptive protection concepts, IEC standards.

Reference Books:

1.Kezunovic M., Adamiak M.O., Apostolov A.P. and Glibert J.G., "Substation Automation", Springer Verlog,2010

2. Brand K., Lohmann V. and Wimmer W., "Substation Automation Handbook", Utility Automation Consulting Lohman, 2003

3.Grigsby L. L., "Electric Power Engineering Handbook", 2nd Ed., CRC Press, 2007

4.Stauss C., "Practical Electrical Network Automation & Communication Systems", Elsevier Eastern Limited, 2003

5. McDonald J. D., "Electric Power Substations Engineering", CRC Press, 2003

MPS 152: Power System Modelling & Simulation Lab

L T P: 0-0-4 **Credit: 2**

1. Simulation of swing Equation using Simulink.
2. Design of FACTS Controller with FACT devices for SMIB system.
3. Load flow study of a 3-phase power system.
4. Transient stability study of single machine considering the effect of excitation and governor systems connected to infinite bus.
5. State estimation of a power system using Weighted Least Square method.
6. Formation of Z-bus matrix of a power system.

MPS 153: Power System Control and Protection Lab

L T P: 0-0-4 **Credit: 2**

1. Generation scheduling of hydro-thermal system.
2. Optimal power flow of a power system.
3. Simulation of load frequency control.
4. Simulation of single machine supplying isolated load for voltage stability evaluation.
5. Simulation of instantaneous and time lag over current relay.
6. Simulation of unbiased and biased differential relays.
7. Simulation of distance relay.

Annexure-XXIV-B of Agenda Item no. 6.23

M.Tech.

in

Electrical and Electronics Engineering with specialization in Instrumentation & Control

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Electrical and Electronics Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Electrical and Electronics Engineering
School:	School of Engineering and Technology
Name of the Course:	M. Tech. in Electrical and Electronics Engineering with specialization in Instrumentation & Control
Duration:	Two years
Total number of Credits:	66
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. S.K. Bhattacharya, HOD — Chairman 2. Prof. H. O. Gupta, Director, JIIT, Noida — Ext. Member 3. Prof. Surekha Bhanot, BITS, Pilani — Ext. Member 4. Prof. H.K. Verma, Dist. Professor — Int. Member 5. Prof. J.D. Sharma, Dist. Professor — Int. Member 6. Mr. S.P. Jaiswal, Asstt. Professor — Int. Member 7. Mr. Vadhtya Jagan, Asstt. Professor — Int. Member 8. Mr. C. Mohan, Asstt. Professor — Int. Member 9. Ms. Soma Deb, Asstt. Professor — Spl. Invitee
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by BOS and Faculty Board

COURSE STRUCTURE

M. Tech. in Electrical and Electronics Engineering with specialization in Instrumentation & Control

SEMESTER	Courses (L-T-P) Credits							L. Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Analog & Digital Signal Processing (3-0-0) 3	Smart Sensors & Sensor Networking (3-0-0) 3	Advanced Control Systems (3-1-0) 4	Departmental Elective-1 (3-0-0) 3	Optimization Techniques in Engineering (3-1-0)4	Signal Processing Lab (0-0-4)2	Foreign Language (1-0-2) 2	**6**	**16**	**2**	**6**	**24**	**21**
II	Telemetry and SCADA (3-0-0) 3	DCS & PLC (3-0-0)3	Departmental Elective-2 (3-0-0) 3	Departmental Elective-3 (3-0-0) 3	Open Elective (3-0-0) 3	Process I & C Lab (0-0-4)2	Technical Communication (1-0-2)2	**6**	**16**	**0**	**6**	**22**	**19**
III	Seminar (0-0-2)2	Project (0-0-4) 4	Dissertation (0-0-15) 8					**0**	**0**	**0**	**21**	**21**	**14**
IV	Dissertation (0-0-21) 12							**0**	**0**	**0**	**21**	**21**	**12**

Total Credits- 66

LIST OF DEPARTMENTAL ELECTIVES

1. Biomedical Instrumentation
2. Embedded Systems
3. Power System Instrumentation
4. Advanced Microprocessors & Microcontrollers
5. Advanced Process Instrumentation & Control
6. Bioelectric Signals & Processing
7. Computer Applications in Healthcare
8. Digital Image Processing
9. Ultrasonic & Laser Instrumentation
10. Intelligent Instrumentation & Computer Aided Testing
11. Modelling and Control of Industrial Processes
12. Virtual Instrumentation
13. Mechatronics
14. Industrial Automation & Robotics
15. Building Automation & Energy Management
16. Power Plant Automation

LIST OF OPEN ELECTIVES

Nil

M.Tech.

in

Electrical and Electronics Engineering

with specialization in

Instrumentation & Control

SYLLABI

MIC101: Analog and Digital Signal Processing

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction
(4)

Continuous-time and discrete-time signals and their mathematical representation, analog and digital signals, analog signal processing (ASP) and digital signal processing (DSP).

UNIT 2: Electronic Amplifiers
(10)

Operational amplifier: block diagram, equivalent circuit, ideal and practical operational amplifier; inverting and non-inverting amplifier circuits, integrator and differentiator circuits, summing and differential amplifier circuits; instrumentation amplifier; bridge amplifier, chopper type dc amplifier

UNIT 3: Electronic Filters
(8)

Passive and active filters, their comparison; frequency response of low- pass, high- pass ,band- pass, band- stop and notch filters and their use in instrumentation; Active filters: Basic low- pass filter circuit , first and second order low- pass and high- pass Butterworth filters, higher order filter realization, first and second order low- pass filters, narrow band- pass filter, narrow band reject (notch) filter.

UNIT 4: Basics of DSP
(5)

Basic DSP system, sampling of analog signals, sampling frequency and theorem, aliaising, band limiting, roles of pre-processing, analog to digital converter, sample-and-hold circuit and digital to analog converter.

UNIT 5: Digital Filters
(8)

The Z transform and its application in digital filter design, Direct form-1 and form-2 realizations, cascade and parallel realizations, recursive and non-recursive methods of realizations.

UNIT 6: Frequency Analysis
(5)

Digital Fourier transform (DFT), DFT algorithm for frequency analysis; Fast Fourier transform (FFT), FFT algorithm for frequency analysis.

Reference Books:

1. Rangan C.S., Sharma G. R. and Mani V.S.V., “Instrumentation Devices and Systems”, 3rd Edition, Tata Mc-Graw Hill, 1999.
2. Murty DVS, “Transducers and Instrumentation”, Prentice Hall of India, 2006.

3. Doeblin ED and Manik D.N., “Measurement Systems –Application and Design”, Tata Mc-Graw Hill, 2007.
4. Johnson J.R, “Introduction to Digital Signal Processing”, Prentice Hall of India, 2001.

MIC102: Smart Sensors and Sensor Networking

L T P: (3-0-0) **Credits: 3**

Unit 1: Review of Basic Concepts **(4)**
Measurement system, transducers, sensors and actuators; signal conditioners; data communications and networking.

Unit 2: Basics of Smart Sensors **(5)**
Definition and architecture of smart sensor; different levels of integration in small sensors, differences between smart, intelligent and network sensors ;advantages of smart sensors ;smart actuators and transmitters.

Unit 3: Smart Sensor Technologies **(5)**
IC Technologies: thick film, thin film and monolithic IC technologies; Micro-machining processes: materials for micro-machining, wafer bonding, bulk and surface micromachining, other micro-machining techniques.

Unit 4: Examples of Smart Sensors **(6)**
Principles, characteristics and constructional details of typical smart sensors for temperature, humidity, pressure and vibrations.

Unit 5: Basics of Sensor and Actuator Networking **(5)**
Field-level, controller-level and enterprise-level networks; Sensor and actuator network (SAN): Network topologies; seven-layer OSI model of communication system.

Unit 6: Wired Network Protocols **(5)**
RS-422, RS-485, HART and Foundation Fieldbus protocols, comparison with Ethernet (IEEE – 802.3) protocol.

Unit 7: Wireless Network Protocols **(5)**
Need and advantages of wireless sensor and actuator network(WSAN); Zigbee (IEEE – 802.15.4) protocol, Merits of Zigbee over WiFi (IEEE – 802.11) and Bluetooth for sensor and actuator networking.

Unit 8: IEEE Standard 1451 **(5)**
Introduction to IEEE Standard 1451: “Smart Transducer Interface for Sensors and Actuators”; highlights of parts 1451.1, 1451.2, 1451.3, 1451.4 and 1451.5 of the Standard.

Reference Books:

1. D. Patranabis, “Sensors and Transducers”, 2nd Edition, 2003.
2. Randy Frank, “Understanding Smart Sensors”, 2nd Edition, 2000.
3. E.H. Callaway, “Wireless Sensor Networks : Architecture and Protocols”,
4. M.M.S. Anand, “Electronic Instruments and Instrumentation Techniques”, Prentice Hall, 2004.

5. William Stallings, “Data and Computer Communications”, Pearson Education, 8th Edition, Pearson- Prentice Hall, 2007.
6. IEEE Standard 1451, “ Smart Transducer Interface for Sensor and Actuators”

MIC103: Advanced Control Systems

L T P: 3-1-0 **Credits: 4**

UNIT 1: Introduction **(6)**

State space model of dynamic systems in continuous time and discrete time; solution of continuous state equation-similarity transformation, Cayley Hamilton approach and inverse Laplace approach; solution of discrete time state equation.

UNIT 2: Controllability and Observability **(8)**

General concept, controllability and Observability test for continuous time and discrete time system; loss of controllability and Observability due to sampling; controllable and observable canonical forms.

UNIT 3: Nonlinear Control Systems **(10)**

Nonlinear models, equilibrium points, linearization of nonlinear models; separable nonlinearities; describing function analysis; phase plane analysis; bang-bang control system; feedback linearization.

UNIT 4: Stability analysis **(8)**

Stability of continuous and discrete time linear system; stability of nonlinear system; Lyapunov stability and instability theorem; Lyapunov direct method for continuous and discrete time system.

UNIT 5: Controller/Observer Design **(8)**

Pole placement technique; Ackerman approach and linear quadratic regulator for continuous and discrete time system; sliding mode control.

Reference Books:

1. Stefani, R.T. Shahuian B, Sawant C.J and Hostetter G.H., “ Design of Feedback Control Systems”, Oxfird University Press, 2001
2. Kailath T., “ Linear Systems”, Prentice Hall, 1996
3. Khalail.H, “ Nonlinear Systems”. 3rd Ed. Nacmillan, 2002
4. Slotine, J.J and Li. W.P, “Applied Nonlinear Control”, Prentice Hall,1991

5. Vidyasagar M, "Nonlinear Systems Analysis", 2nd Ed, Prentice Hall, 1992

MIC 104: Optimization Techniques in Engineering

L T P: 3-1-0 **Credits:4**

UNIT 1: Algebraic Equations **(5)**

Iterative methods for solving linear and nonlinear equations

UNIT 2: Differential Equations **(4)**

Finite difference method ,Euler and Runge-Kutta methods

UNIT 3: Optimization problems **(5)**

Types of optimization problems, feasible region, necessary and sufficient optimality conditions

UNIT 4: Unconstrained Optimization Techniques **(6)**

Direct Search and gradient based methods

UNIT 5: Constrained Optimization Methods **(8)**

Linear and quadratic programming methods, penalty function, Lagrange multiplier and gradient projection methods

UNIT 6: Evolutionary Techniques **(5)**

Genetic algorithm, particle swarm and ant colony optimization methods

UNIT 7: Integer Programming **(4)**

Branch and bound method and cutting plane method.

UNIT 7: Case Studies **(3)**

Text Books:

1.Balagurusamy, E., "Numerical Methods ", Tata McGraw-Hill, 1999

2.Rao S.S, "Applied Numerical Methods for Engineers and Scientists", Pearson Education, 2001

3.Rao S.S., "Engineering Optimization: Theory and Practice", Wiley Eastern, 2009

Reference Books:

1.Burden R.L. anf Faires J.D., "Numerical Analysis", Brooks/Cole, 9th Edition, 2011

2.Song Y.H., "Modern Optimization Techniques in Power Systems", Kluwer Academic, 1988

3.Deep K. and Chandra Mohan, Optimization Techniques", New Age International Publication, 2009

4.Deb K., "Optimization for Engineering Design Algorithms and Examples", PHI Learning, 2004

EIE 010: Telemetry and SCADA

L T P: 3-0-0 **Credits: 3**

UNIT 1: Introduction (3)

Meaning and purpose of telemetry, remote control and SCADA; Message versus signal; Signal formation, conversion and transmission.

UNIT 2: Analog Communication Techniques (6)

Analog modulation of AC carrier; Amplitude modulation and frequency spectrum of AM wave; Frequency modulation and frequency spectrum of FM wave; Phase modulation and frequency spectrum of PM wave; FM versus PM; Analog modulation of pulse carrier, basics of PAM, PFM, PWM and PPM.

UNIT 3: Digital Communication Techniques (5)

Digital modulation of pulse carrier, basics of PCM and DPCM; Digital modulation of AC carrier, ASK, FSK and ASK; Error detection and correction methods, error control techniques.

UNIT 4: Signal Transmission Media and Multiplexing (8)

Copper wires and cables; Basics of radio communication, terrestrial radio and satellite radio; Basics of optical fibres and optical fibre communication; Basics of TDM, FDM and WDM.

UNIT 5: Telemetry (8)

Basic telemetry scheme and its components; Telemetry error and its sources; Direct voltage and direct current telemetry systems; AM and FM telemetry systems; Multi-channel PAM and PWM telemetry systems; Single and multi-channel digital telemetry systems; Short-range radio telemetry and satellite telemetry.

UNIT 6: SCADA (10)

Supervisory control versus distributed control; Layout and parts of SCADA system, detailed block schematic of SCADA system; Functions of SCADA system: data acquisition, monitoring, control, data collection and storage, data processing and calculation, report generation; MTU: functions, single and dual computer configurations of MTU; RTU: functions, architecture / layout; MTU-RTU communication and RTU-field device communication.

Reference Books:

1. D. Patranabis, Telemetry Principles,Tata-McGraw Hill, 2001.
2. Stuart A. Boyer, Supervisory Control and Data Acuisition(SCADA),4th Edition, International Society of Automation, 2010.

3. Torsen Cegrell, Power System Control Technology,Prentice Hall,1986.
4. Wayne Tomasi, Electronic Communication Systems, Pearson Education, 2008.
5. William Scheber, Electronic Communication Systems, Prentice Hall, 2005.
6. William Stallings, Data and Computer Communications, 8th Edition, Pearson-Prentice Hall, 2007.

MIC 105: DCS & PLC

L T P: 3-0-0 **Credits: 3**

UNIT 1: Computer Based Control **(3)**

Implementing control system using computer or microprocessor; computer based controller: hardware configuration and software requirements.

UNIT 2: Distributed Control System **(3)**

Meaning and necessity of distributed control; hardware components of DCS; DCS software.

UNIT 3: Introduction Programmable Logic Controller (PLC) **(3)**

What is PLC?, PLC versus microprocessor/microcontroller/computer, advantages and disadvantages of PLC, architecture and physical forms of PLC.

UNIT 4: Basic PLC functions **(4)**

Registers: holding, input and output registers; Timers and timer functions; counters and counter functions

UNIT 5: Intermediate PLC functions **(4)**

Arithmetic functions: addition, subtraction, multiplication, division and other arithmetic functions; Number comparison and conversion.

UNIT 6: Data Handling Functions of PLC **(4)**

Skip function and applications; master control relay function and applications; jump with non-return and return; data table, register and other move functions.

UNIT 7: Bit Functions of PLC **(4)**

Digital bit functions and applications; sequencer functions and applications.

UNIT 8: Advanced Functions of PLC **(5)**

Analog input and output functions, analog input and output modules, analog signal processing in PLC; PID control function, network communication function.

UNIT 9: PLC programming **(10)**

PLC programming languages, ladder programming, mnemonic programming and high level language programming.

Reference Books:

1. Johnson C. D., "Process Control Instrumentation Technology", 8th Ed., Prentice Hall of India, 2008.
2. Chemsmond C. J., "Basic Control System Technology", Viva Books, 2004
3. J.W. Webb, R.A. Reis, " Programmable Logic Controllers" Prentice-Hall India, 2004
4. J.R. Hackworth and F.D. Hackworth, " Programmable Logic Controllers", Pearson Edition, 2005

EIE 002: Biomedical Instrumentation

L T P: 3-0-0 **Credits: 3**

UNIT 1: Human Body Subsystems (4)

Brief description of neuronal, muscular, cardiovascular and respiratory systems; their electrical, mechanical and chemical activities.

UNIT 2: Transducers and Electrodes (4)

Principles and classification of transducers for biomedical applications; Electrode theory, different types of electrodes.

UNIT 3: Cardiovascular System Measurements (4)

Measurement of blood flow, cardiac output, cardiac rate, heart sounds; Electrocardiograph; Phonocardiograph; Plethymograph; Echo-cardiograph.

UNIT 4: Respiratory System Measurements (4)

Measurement of gas volume, flow rate, carbon-dioxide and oxygen concentration in exhaled air.

UNIT 5: Instrumentation for Clinical Laboratory (4)

Measurement of pH value of blood, ESR measurement, haemoglobin measurement, O_2 and CO_2 concentration in blood, GSR measurement, polarographic measurements.

UNIT 6: Measurement of Electrical Activity in Neuromuscular System and Brain (4)

Neuron potential, muscle potential, electromyograph, brain potentials, electroencephalograph.

UNIT 7: Medical Imaging (4)

Diagnostic X-rays, CAT, MRI, thermography, ultrasonography, medical use of Isotopes, endoscopy.

UNIT 8: Patient Care, Monitoring and Safety Measures (3)

UNIT 9: Prosthetics and Orthotics (5)

Introduction to artificial kidney, artificial heart, heart lung machine, limb prosthetics and orthotics.

UNIT 10: Assisting and Therapeutic Devices (4)

Introduction to cardiac pacemakers, defibrillators, ventilators, muscle stimulators, diathermy.

Reference Books:

1. Geddes L. A. and Baker L. E., "Principles of Applied Biomedical Instrumentation", John Wiley & Sons,1989
2. Khandpur R. S., "Handbook on Biomedical Instrumentation", 2nd Ed., Tata McGraw-Hill, 2008
3. Cromwell L., Weibell F. J. and Pfeifer E. A., "Biomedical Instrumentation and Measurements", Prentice Hall of India, 2003
4. Aston R., "Principles of Biomedical Instrumentation and Measurements", Macmillan, 1991.
5. Antoui H., Chilbert M. A., & Sweeny J. D., "Applied Bioelectricity", Springer-Verlag, 1998.
6. Hill D. W. and Dolan A. M., "Intensive Care Instrumentation", 1982.

MVT 104: Embedded Systems

L T P: 3-0-0 **Credits: 3**

UNIT 1: Introduction (2)

What is Embedded system? hardware and software components of embedded system; system-on chip.

UNIT 2: Review of Processor and Memory (8)

General-purpose processors, single-purpose processors, application specific processors, CISC and RISC processor architecture, arm processors; memory devices; processor and memory selection for an embedded system; interfacing processor, memory and I/O devices, 8/16 bit microcontrollers.

UNIT 3: Devices and Buses (8)

Review of I/O and timer devices; parallel communications using ISA, PCI and other buses; serial communication using I^2C, CAN, USB and advanced buses; interrupt serving mechanism; device drivers.

UNIT 4: Embedded Programming (6)

Review of programming in ALP and in C, embedded programming in C++, memory organization, compiler and cross compiler.

UNIT 5: Embedded Software Development (5)

Program modelling concepts, modelling processes for software analysis, response time constraint for real time programs.

UNIT 6: Real Time Operating Systems (6)

Operating system services, I/O subsystems, network operating systems, embedded system operating systems, interrupt routines in RTOS environment.

UNIT 7: Hardware-Software Co-design (5)

Embedded system design and co-design issues, software tools for development of embedded systems

Reference Books:

1. Kamal R., "Embedded Systems – Architecture, Programming and Design", Tata McGraw-Hill, 2008.
2. Vahid F. and Givargis T., "Embedded System Design – A Unified Hardware/Software Introduction", Wiley India, 2008

3. Berger A. S., “Embedded System Design – An Introduction to Processes, Tools and Techniques”, CMP Books, 2001.
4. Labrosse J. J., “Embedded Systems Building Blocks”, 2nd Ed., CMP Books, 1999
5. Barr M., “Programming Embedded Systems in C and C++”, O’Reilly,1999

MPS 111: Power System Instrumentation

L T P: 3-0-0 **Credits: 3**

UNIT 1: Measurement of Electrical Quantities (7)

Measurement of voltage, current, phase angle, frequency, active power and reactive power in power system without and with CTs/VTs; Energy meters and multipart tariff meters.

UNIT 2: Voltage and Current Transformers (6)

Voltage transformers for measurement and protection, errors, transient performance; capacitive voltage transformers and their transient behavior; Current transformers for measurement and protection, composite errors, transient response.

UNIT 3: Hydro Electric Power-Plant Instrumentation (7)

Measurement of flow, level, pressure, temperature, hydraulic head and mechanical vibrations; Temperature scanners; Alarm annunciatiors.

UNIT 4: Thermal Power-Plant Instrumentation (7)

Measurement of gas flow; Gas and feed-water analysis; Flame monitoring; Steam turbine instrumentation.

UNIT 5: Nuclear Power-Plant Instrumentation (7)

Reactor safety, neutron flux measurement; Reactor power level and coolant measurements.

UNIT 6: Overview of Protective Relaying and Relays (6)

Philosophy of protective relaying**,** primary and backup protection; Organization and elements of a protective relay, single-input, two-input and multi-input relays; Electromagnetic, electronic and digital relays.

Reference Books:

1. “Modern Power Station Practice, Volume F: Control and Instrumentation”, British Electricity International, Peragmon Press, 1990
2. T.C. Elliott, “Standard Hand Book of Power Plant Engineering”, McGraw-Hill International Book Company, 1989.
3. A. R. van C. Warrington, “Protective Relays- Their Theory and Practice”, Vol. 1, Chapman & Hall Ltd., 1968
4. T. S. M. Rao, “Power System Protection – Static Relays with Microprocessor Applications”, 2nd Ed., Tata McGraw-Hill, 2008.

MIC 001: Advanced Microprocessors and Microcontrollers

L T P: 3-0-0 **Credits: 3**

UNIT 1: Evolution of Microprocessors (3)
Intel 8080, 8085, 8086, 8088, 80186, 80286, 80386, 80486.

UNIT 2: Architecture of 16-bit Microprocessor (6)
Concept of pipelining and memory segmentation, logical address, offset address and physical address; Bus Interface Unit (BIU); Execution Unit (EU), segment registers.

UNIT 3: Operation of 16-bit Microprocessor (6)
Pin configuration of Intel 8086/8088; Minimum and maximum modes of operation; Address bus, data bus and control bus; Clock generator Intel 8284; Memory organization, memory address space.

UNIT 4: Addressing Modes (5)
Data related addressing modes- register, immediate, direct, register indirect, based relative, indexed relative and based indexed, branch related addressing modes- intrasegment direct and indirect, intersegment direct and indirect.

UNIT 5: Instruction Set of 16-Bit Microprocessor (6)
Machine cycles, data transfer, arithmetic, bit manipulation, string, program execution transfer and processor control instructions.

UNIT 6: Interrupt Structure of 8086 (4)
Interrupt pointer, type numbers, processing of interrupt, internal and external interrupts, interrupt priorities, BIOS routines.

UNIT 7: 16 Bit Microcontroller (5)
Architecture, pin description and instruction set of a typical 16 bit microcontroller

UNIT 8: PIC microcontroller (5)
Architecture, pin description and instruction set of PIC microcontroller

Reference Books:

1. Liu Yu-Cheng and Gibson G. A., “Microcomputer Systems; The 8086/8088 Family”, 2nd Ed., Prentice Hall, 2007
2. Brey B. B., “Intel 8086, 8088, 80186, 80187, 80286, 80386, 80486, Pentium and Pentium-Pro Processors, Architecture, Design and Application”, Prentice Hall, 2006
3. Ramesh S Gaonkar, “ The fundamental of microcontroller and application in Embedded with PIC microcontroller”.
4. Peatman J.B, “ Design with PIC microcontroller”, Pearson Education, 2008

5. Deshmukh, “Microcontroller Theory and application”, Tata McGrawHill, 2008
6. Triebel W.A. and Singh A., “The 8088 and 8086 Microprocessors, Programming Interfacing, Software, Hardware and Applications”, 4th Ed., Prentice Hall of India, 2007

MIC 002: Advanced Process Instrumentation and Control

L T P: 3-0-0 **Credits: 3**

UNIT 1: Concepts of System Response (4)
Response of first order systems including transfer function and transient response to different forcing functions; Response of first order systems in series

UNIT 2: Sensors (8)
Basic concepts and working principles of sensors and transducers for measuring process variables like pressure, temperature, level and flow; electromechanical, capacitive, inductive, resistive and photoelectric type proximity sensors.

UNIT 3: Controller Principles (6)
Process characteristics; Control system parameters; Discontinuous controller modes; Continuous controller modes; Composite control modes.

UNIT 4: Analog Controllers (5)
General features; Electronic controllers; Pneumatic controllers; Design considerations.

UNIT 5: Digital Controllers (5)
Digital computer simulation of control systems; Computer software for process control; Microprocessor based controller.

UNIT 6: Control Loop Characteristics (4)
Control system configuration; Multivariable control system; Control system quality and stability; Process loop tuning.

UNIT 7: Control Equipment & Final Control Elements (8)
Details of controllers including measurement unit, comparator, actuator and final control elements; Pneumatic, hydraulic and electric actuators; Control valve characteristics; Pneumatic to electric and electric to pneumatic converters.

Reference Books:

1. Coughanowr D. R., “Process Systems Analysis and Control”, 2nd Ed., McGraw-Hill, 2008
2. Johnson C. D., “Process Control Instrumentation Technology”, 8th Ed., Prentice Hall of India 2008
3. Harriott Peter, “Process Control”, Tata McGraw-Hill, 2008
4. Chemsmond C. J., Wilson and Lepla, “Advanced Control System Technology”, Viva Books Private Ltd. 2004

MIC 003: Bioelectric Signals and Processing

L T P: 3-0-0 **Credits: 3**

UNIT 1: Basic Neurology **(4)**
Nervous System, neuron; Resting potential; Nernst equation; Electrical equivalents.

UNIT 2: Noise and Interference in Bioelectric Signals **(3)**
Sources of noise in bioelectrical signal recordings; Grounding and shielding.

UNIT 3: Filtering of Bioelectric Signals **(4)**
Filtering techniques-active and passive filters; Digital filtering.

UNIT 4: **Electrical Activity of Heart** **(8)**
Introduction to ECG Lead system and recording; ECG wave component detection and analysis; Vector cardiography; Inverse cardiography; Signal conditioning and processing.

UNIT 5: **Electrical Activity of Neuromuscular System** **(4)**
Muscular system; Electrical signals of motor unit and gross muscle; Human motor coordination system; Electrodes; Correlation of force and work; EMG integrators; Signal conditioning and processing.

UNIT 6: **Electrical Activity of Brian** **(4)**
Sources of brain potentials; Generation of signals, component waves; EEG recording electrodes, 10-20 electrode system; EEG under normal, Grand mal and Petit mal seizures; Signal conditioning and processing.

UNIT 7: **Electrical Signals from Visual System** **(4)**
Sources of electrical signals in eye; Generation of signals; Electroretinogram; Electrooccculogram; Analysis of signals

UNIT 8: **Electrical Signals from Auditory System** **(3)**
Generation of cochlear potentials and nature; Evoked responses; Auditory nerves; Signal conditioning and processing.

UNIT 9: **Frequency Analysis of Bioelectric Signals** **(6)**
z-Transform; Fourier transform; Fast Fourier transform; Frequency analysis; Filtering of signals in frequency domain.

Reference Books:
1. Rangayyan R. M., “Biomedical Signal Analysis”, John Wiley & Sons, 2002
2. Bruce E. N., “Biomedical Signal Processing and Signal Modeling”, John Wiley & Sons, 2006
3. John L. Semmlow, “Biosignal and Biomedical Image Processing : MATLAB-Based Applications”, CRC press. 2008
4. Amine N. A., “Advanced Biosignal Processing”, Springer, 2009
5. Tompkins W. J., “Biomedical Digital Signal Processing: C Language Examples and Laboratory Experiments for the IBM PC”,Prentice Hall of India, 2006

6. Sawhney G.S., “Fundamentals of Biomedical Engineering”, New Age International, 2007

MIC 004: Computer Applications in Healthcare

L T P: 3-0-0 **Credits: 3**

UNIT 1: Computer in Data Collection (5)
Introduction; Basic building blocks of data acquisition systems; Use of computers in physiological data acquisition; Off-line data collection; Data collection techniques; Patient database; Computerized medical records.

UNIT 2: Hospital Data Management (4)
Hospital information system; Functional capabilities of computerized hospital information system; Efficiency; security and cost effectiveness of computer records; Patient data management.

UNIT 3: Automated Clinical Laboratory System (5)
Database approach to laboratory computerization; Automated clinical laboratories; Automated methods in haematology, Chromosome analyzers; Computerized cytology and histology.

UNIT 4: **Bio-signal Analysis (6)**
Computerized electrocardiography; Holter electrocardiography; Electromyography; Electroencephalography and echocardiography; Computer analysis of non-electrical bio-signals; Computer aided medical decision making.

UNIT 5: **Medical Imaging (8)**
Introduction to medical imaging; Computes in medical imaging, Nuclear medicine, Digital subtraction radiography, Computerized ultrasonography, X-rays, Computerized tomography, Computerized emission tomography, Nuclear magnetic resonance.

UNIT 6: Computer-Assisted Therapy (6)
Computer based cardiac assist devices; Computers for care of renal disorders; Computer based cancer chemotherapy; disorders; Protocol advisors; Radiotherapy; Diabetes management; Automated drug delivery; Lithotripsy.

UNIT 7: Medical Research (6)
Computer in simulation, modeling and analysis of bio-systems; On-line interactive systems with patients for analysis and research.

Reference Books:

1. Joseph D. Bronzino, “Biomedical Engineering Handbook”, Second Edition Volume II , CRC Press, 2000
2. Atam P. Dhawan, “Medical Image Analysis”, John Wiley & Sons, Inc., 2003
3. John G. Webster, “Encyclopedia of Medical Devices and Instrumentation”, (Volume 1-4), John Wiley & Sons, Inc, 1988
4. Suetens P., “ Fundamentals of Medical Imaging”, 2nd Edition, Cambridge University Press 2009

5. Bichindaritz I., Vaidya S., Jain A., and Jain L .C., “Computational Intelligence in Healthcare: Advanced Methodologies”, Springer-Verlag, 2010

INT 002: Digital Image Processing

L T P: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(4)**

Human visual system and visual perception, image sensing and acquisition, image file types, pixel representation and relationship.

UNIT 2: Discrete Signals and Systems **(6)**

2-D signals and their representation; linear, shift-invariant, causal and BIBO stable systems.

UNIT 3: 2-D Signal Operations **(3)**

Additions, multiplications, shifting, folding, convolution- linear and circular convolution.

UNIT 4: 2-D Signal Transforms **(5)**

2-D continuous time and discrete-time Fourier transform, 2-D discrete Fourier transform, 2-D z-transform and stability concepts.

UNIT 5: 2-D Digital Filters **(4)**

Design of 2-D FIR filters, design of 2-D FIR filters.

UNIT 6: Image Enhancement and Restoration Techniques **(6)**

Contrast modification and stretching, histogram equalization, unsharp masking, homomorphic processing, interpolation, mean and median filtering, least square and Wiener filtering.

UNIT 7: Image Segmentation Techniques **(6)**

Thresholding, edge based segmentation, region based segmentation.

UNIT 8: Image Compression Techniques **(6)**

Fundamentals of image compression, loss-less compression techniques, lossy compression techniques.

Reference Books:

1. Bose T., “Digital Signal and Image Processing”, Wiley India, 2008
2. Gonzalez R. C. and Woods R. C., “Digital Image Processing”, 2nd Ed., Pearson Education, 2007
3. Jain A. K, “Fundamentals of Digital Image Processing”, Prentice Hall of India, 2007
4. Sonaka M., Hlavac V. and Boyle R., “Image Processing, Analysis and Machine Vision”, 2nd Ed., Cengage Learning, 2008

MIC 005: Ultrasonic and Laser Instrumentation

L T P: 3-0-0 **Credits: 3**

UNIT 1: Ultrasonic Wave Motion (5)
Non-planer waves, Interference of waves: Plane sound waves at boundaries: Wave physics of sound field

UNIT 2: Ultrasonic Wave Generation and Reception (5)
Piezoeletcric method: Mechanical effects: Thermal effects and laser techniques: Electrostatic methods: Electrodynamoc methods(EMATs): Magnetostrictive methods: Optical methods: Transducer structure and design

UNIT 3: Ultrasonic Scanning and Testing Methods (6)
Echo from and shadow of an obstacle in the sound field: Pulse echo method: Design and Performance of a pulse-echo detector

UNIT 4: Ultrasonics in Industrial Testing and Measurement (5)
Various scanning methods used in industry: Transit-time method: Imaging and methods of reconstruction: Various industrial applications

UNIT 5: Ultrasonics in Medial Diagnosis (4)
Scanning methods used in medical field: Doppler method: Various applications

UNIT 6: Properties and Generation of Laser (4)
Definition, properties, requirements for generation of laser

UNIT 7: High Intensity Applications of Lasers in Industry (5)
Surface hardening, welding, cutting, laser assisted machining, laser marking, hole piercing, alloying and cladding

UNIT 8: Low Intensity Applications of Lasers in Industry (3)
Scanning, shadow projection, alignment, triangulation,

UNIT 9: Application of Laser in Medical field (3)
Lasers used in medical field and their properties; Laser surgery

Reference Books:

1. Krautkramer J. and Krautkramer H., “Ultrasonic Testing of Materials, Springer Verlag, 1990
2. Kundu T. “ Ultrasonic Nondesrtructive Evaluation : Engineering and Biological Material Characterization”. CRC Press, 2000
3. Shull P. J., “Nondestructive Evaluation : Theory, Trchniques and Applications”, Marcel Dekker, 2002
4. Luxon J. T. and Parker D. E,, „Industrial Lasers and their Application“, Prentice Hall International, 1985.

M.Tech.

in

Energy and Environmental Engineering

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2012-13)

Research and Technology Development Centre

SHARDA UNIVERSITY

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SUMMARY SHEET

Centre:	Research and Technology Development Centre
Name of the Course:	M. Tech. in Energy and Environmental Engineering
Duration:	Two years
Total number of Credits:	66
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Dr.S.K.Mishra — Chairman 2. Prof. V.D.Vankar, IIT Delhi — Ext. Member 3. Prof. A.P.Gupta, Tech.Univ.,Delhi — Ext. Member 4. Dr.D.N.Singh, Indosolar,G.Noida — Ext. Member 5. Dr.G.R.Niyati, Moserbaer, G.Noida — Ext. Member 6. Dr.Akhilesh Gupta, DST,New Delhi — Ext. Member 7. Prof. N.B.Singh — Int. Member 8. Dr.P.K.Singh — Int. Member 9. Dr.Rajesh Kumar — Spl. Invitee
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by BOS and Faculty Board

CREDITS DISTRIBUTION M.TECH.ENERGY AND ENVIRONMENTAL ENGINEERING

SEMESTER	Courses (L-T-P)							Lecture Courses	Contact Hr. / Week				Credits
									L	T	P	Total	
I	Energy Sources and Global Scenario (3-1-0) 4	Basic concepts of sustainable development (3-1-0) 4	Earth, Energy and Environment (3-0-0) 3	Environmental Chemistry (3-0-0) 3	Air Pollution and Control (3-0-0) 3	Foreign Language (1-0-2) 2	Practical (0-0-4) 2	6	16	2	6	24	21
II	Water Resources and waste water treatment (3-0-0) 3	Solid & Hazardous Waste Management (3-0-0) 3	Environmental Impact Assessment and Audits (3-0-0) 3	Elective: (3-0-0) 3	Open Elective: (3-0-0) 3	Technical Communication (1-0-2) 2	Practical (0-0-4)2	6	16	0	8	24	19
III	Seminar 2	Project 4	Dissertation 8					-	-	-	-	-	14
IV	Dissertation 12							-	-	-	-	-	12
							TOTAL	-	-	-	-	-	66

C-X-Y (Course-Semester-Paper No.); L- lecture, T- tutorial, P- practical **Total Credits – 66**

* Department is free to decide the number of core and elective courses with at least one open elective and a minimum of core courses of 12 credits and can have as many courses with tutorials as it wants with a restriction that overall credits will not be less than 64 and not more than 68. The total credits in 1st and 2nd semester may range from 38 to 42

LIST OF DEPARTMENTAL ELECTIVES

1. Energy Audit
2. Science of Climate Change
3. Remote Sensing and GIS

LIST OF OPEN ELECTIVES

1. Biodiversity and Conservation
2. Environmental Biotechnology

M.Tech.

in

Environment and Environmental Engineering

SYLLABI

1.Energy Sources and Global Scenario

L T P: 3-1-0 **Credit: 4**

UNIT-I

Different Energy Sources **8**

Renewable Energy Sources- Solar Energy, Wind Energy, Biomass Energy, OTEC, Non Renewable Energy Sources-Coal, Petroleum, Natural gas etc., Hydrogen energy, Nuclear fuels.

UNIT-II

Direct Energy Conversion **8**

Magneto Hydro Dynamics (MHD) Power, Solar Photo Voltaic, Fuels Cells, Energy from Biomass, Thermo-chemical and Biochemical Conversion of Fuels, Biogas and its Applications.

UNIT-III

Energy Scenario **12** Global and National Energy Scenario – Current Energy Exploitation, Long Term Energy Scenario, Energy Pricing, Energy Security, Energy Conservation and its Importance, Energy Strategy for the Future, Energy Conservation Act-2001 and its Features

UNIT-IV **12**

Global Concerns for Energy

Energy Demand at present, Energy Needs for Growing Economy, Energy Planning, Economic Feasibility of the New Energy Resources, Impacts on Environment and Associated Problems, Energy for Sustainable Development.

References:

1. Energy, Economics and the Environment, 3rd, Bosselman, Eisen, Rossi Spence and Weaver (Foundation Press, 2010).
2. Energy, Economics Growth, and the Environment, Schurr (Ed.), 2010.
3. Managing Our Natural Resources, William G. Camp, Thomas B. Daugherty, Cengage Learning, 01-Dec-2000.
4. Managing Natural Resources with GIS, Laura Lang, ESRI, Inc., 01-Jul-1998.

2. Basic Concepts of Sustainable Development

L T P: 3-1-0 **Credit: 4**

UNIT-I

Introduction **8**

Definition of Sustainable Development, Need of Sustainable Development, Environmental Sustainability, Economic Sustainability, Social Sustainability, Sustainable Agriculture.

UNIT-II

Sustainable Development and Stakeholders **10**

Concepts and Stakeholders, Human Development and Sustainability. Rights of Future Generations. Reduce, Reuse and Recycle. UNDP definition of Development – Indicators, Agenda 21, Case studies.

UNIT-III

Sustainable Development and Business Perspective **10**

Sustainable Development and Business Strategy Prospective, Corporate Social Responsibility, Industrial Ecology, Enhancing Environment Management Systems, Regulatory and Policy Contexts

UNIT-IV

Sustainable Development and Sociological Perspective **12**

Sociological Perspective on Development Problems with special reference to India, Theories/Models of Development, Modernization Theory, World System Theory, Global System Interdependence.

References:

1. Sustainable Development: Economics & Environment in the Third World, David William Pearce, Edward Barbier, Anil Markandya, Earthscan, 1990.
2. Sustainable Development: Critical Issues, Organisation for Economic Co-Operation and Development, OECD Publishing, 28-Jun-2001Environmental Impact Assessment, L. W. Canter, Mc Graw Hill, New York, 2010.

3. Earth , Energy and Environment

L T P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **8**

History and Scope of Environmental Science, Importance of Environmental Science, Environmental Priorities in India, Environmental Ethics. General Idea about Forest Ecosystem- Grassland Ecosystem, Wetland Ecosystems and Aquatic Ecosystem

UNIT-II

Environment **10**

Understanding Earth, Atmosphere and Processes Governing Environmental Conditions; Biosphere, Atmosphere, Cryosphere; Earth's Energy Budget; Climate and Climate Change- Geologic, Tectonic, Hydrological and Biogeochemical Cycles; Melanchovich cycle.

UNIT-III

Ecology **12**

Biotic and Abiotic Components, Production and Consumption, Productivity and Energy Flow, Food Webs, Cycling of Elements. Description and Study of Typical Natural and Artificial Ecosystems, Ecological Niche; Mortality and Survivorship; CommUNITy Interactions; Changes in Ecosystems; Succession, Long Range Change; Stability; Organization and Dynamics of Ecological CommUNITies

UNIT-IV

Environmental Issues **10**

Major Environmental Concerns; Natural hazards and Processes, Dams and Environment, Ozone Hole Depletion, Green House Effect, Global Climate Change and Hazards, Effect of Population Increase on Environment, Climate Change Impact on Glacier Melt and Water Availability and Sea Level Rise.

References:

1. Energy and Environment, 2nd ed. Ristinen and Kraushaar (Wiley, 2005).
2. The Earth System, 2nd ed. Kump, Kasting and Crane (Prentice Hall, 2003).
3. Fundamentals of ecology, 5th ed. Odum and Barret (Thomson, 2005).
4. Introduction to Environmental Engineering and Science, 3rd ed. Masters and Ela (Prentice Hall, 2007).

4. Environmental Chemistry

L T P: 3-1-0 **Credit: 3**

UNIT-I

Physico-Chemical Properties of Water **10**

Structure and Basic Properties of Water - Their Significance in Environmental Engineering, Sources of Water Impurities, Abiotic Reactions, Biological Metabolism. Solid-liquid-gas Interactions, Mass Transfer and Transport of Impurities in Water and Air, Diffusion, Dispersion

UNIT-II

Kinetics & Physico-Chemical Process **12**

Process Kinetics, Reaction Rates and Catalysis, Surface and Colloidal Chemistry, Adsorption. Settling of Particles in Water, Coagulation and Flocculation, Filtration - Mechanisms and Interpretations, Ion Exchange and Adsorption, Water Stabilization, Aeration and Gas Transfer. Membrane Process; Reverse Osmosis, Electro dialysis, Desalination.

UNIT-III

Physico-Chemical Processes in Environment **10**

Physical and Chemical Interactions due to Various Forces, Suspensions and Dispersions. Chemical Reactions, Chemical Equilibrium, and Chemical Thermodynamics, Acid-base Equilibria, Solubility Equilibria, Oxidation/Reduction Equilibria.

UNIT-IV

Green Chemistry **8**

Introduction, Green Chemistry in Day to Day Life, Principles, Biocycles, Synthetic Methods, Industrial Applications.

References:

1. Environmental Chemistry, 3rd ed., Manahan (CRC, 2009).
2. Advanced Physiochemical Treatment Process (handbook of Environmental engineering vol.4) by Lawrence K. Wang, Norman C. Periera, Yung-Tse Hung, Human Press.
3. Introduction to Chemical Engineering Thermodynamics (The McGraw Hill Chemical Engineering Series) by J.M. Smith, Hedrick Van Ness, and Micheal Abbott.
4. Chemical, Biochemical, and Engineering Thermodynamics S Tanley I. Sandler.
5. A textbook of Engineering Chemistry by Sashi Chawla.

5.Air Pollution and Control

L T P: 3-1-0 **Credit: 3**

UNIT-I

Air pollution and its Effects **10**

Air Pollutants - Sources, Classification, Effect on Health, Vegetation, Materials, and Atmosphere. Chemical and Photochemical Reactions in the Atmosphere and their Effects - Smoke, Smog, Acid Rain and Ozone Layer Depletion. Green House Gases, Global Warming and its Implications.

UNIT-II

Air Pollution Legislation and Standards **10**

The Factories Act and Amendment, 1981 - The Air (Prevention and Control of Pollution) Act, 1982 - The Air (Prevention and Control of Pollution) Rules, 1982 - The Atomic Energy Act, 1987 - The Air (Prevention and Control of Pollution) Amendment Act, 1988 - The Motor Vehicles Act.

UNIT-III

Air pollution Dispersion and Modelling **10**

Meteorology and Air Pollution: Atmospheric Stability and Inversions, Behaviour of Air Pollutant Plumes as Affected by Nature of Source, Meteorology, Obstacles and Terrain, Maximum Mixing Depth. Effluent Dispersion Theories - Models for Point and Line Sources Based on Gaussian Plume Dispersion and their Limitations and Models for Heavy Gas Dispersion. Issues of Indoor Air Quality

UNIT-IV

Air pollution Prevention and Control **10**

Control of Air Pollutants - Concepts and the Design Elements of Gravitational Settlers, Centrifugal Collectors, Wet Collectors, Electrostatic Precipitators, Fabric Filters, Condensers. Air Pollution Control by Absorption, Adsorption, Condensation, Incineration, Bioscrubbers, Biofilters, etc. Case Studies.

References:

1. Introduction to Environmental Engineering and Science, G. M. Masters, Prentice-Hall of India, New Delhi, 2011.
2. Air Pollution Control Engineering, N. de Nevers. McGraw Hill, Singapore, 2011.
   Fundamentals of Air pollution, R. W. Boubel, D. L. Fox, and A. C. Stern, Academic Press, NY, 2011.

6. Water Resources and Waste Water Treatment

L T P: 3-1-0 **Credit: 3**

UNIT-I

Water Supply **8**

Sources, Water Demand and Forecasting, Quality of Water, Water Borne Diseases, Standards, Water Quality Index, Water Pollution Sources and Control.

UNIT-II

Physical and Chemical Process of Waste Water Treatment **10**

Physical Process - Flow, Screens, Reactors, Mixing and Flocculation, Sedimentation, Filtration. Chemical Process - Coagulation/Softening, Iron and Manganese Removal, Disinfection, Miscellaneous Processes.

UNIT-III

Wastewater Engineering **10**

Systems of Sanitation, Wastewater Flows, Collection and Conveyance of Wastewater, Layout Systems. Characteristics and Microbiology of Wastewater. BOD Kinetics. Disposal of Treated Wastewater on Land and in Water.

UNIT-IV

Treatment Processes and Flow-Sheets **12**

UNIT Operations and UNIT Processes, Wastewater Flow Rates and Their Assessment/Measurement. Primary Treatment. Biological UNIT Processes - Nature and Kinetics of Biological Growth, Aerobic Activated Sludge Process and Its Various Modifications, Aerobic Activated Lagoons Stabilisation Ponds; Tricking Filters, Roughing Filters, Rotating Biological Contractors, Expanded Bed and Sequential Batch Reactors. Sludge Disposal.

References:

1. Wastewater Engineering – Treatment and Reuse, Metcalf & Eddy, Inc., Revised by G. Tchobanoglous, F. L. Burton, and H. D. Stensel. Tata McGraw-Hill Publishing Company Limited, New Delhi, 2011.
2. UNIT Operations and Processes in Environmental Engineering, T. D. Reynolds, P. Richards. PWS Series in Engineering, Boston, 2010.
3. Manual on Water Supply and Treatment. CPHEEO, Ministry of Urban Development, GoI, New Delhi, 1999.

7. Solid & Hazardous Waste Management

L T P: 3-1-0 **Credit: 3**

UNIT-I

Introduction **10**

Definition, Types, Sources, Characteristics, and Impact on Environmental Health, Waste Generation Rates, Concepts of Waste Reduction, Recycling and Reuse. Handling and Segregation of Wastes at Source. Collection and Storage of Municipal Solid Wastes, Analysis of Collection Systems

UNIT-II

Solid Waste Management **10**

Solid Waste Processing Technologies, Mechanical and Thermal Volume Reduction. Biological and Chemical Techniques for Energy and Other Resource Recovery. Disposal in Landfills - Site Selection, Design, and Operation of Sanitary Landfills, Secure Landfills.

UNIT-III

Hazardous Waste Management **8**

Sources and Characteristics, Handling, Collection, Storage and Transport. Hazardous Waste Treatment Technologies.

UNIT-IV

Physical, **Chemical and Thermal Treatment of Hazardous Waste** **12**

Solidification, Chemical Fixation and Encapsulation, Incineration. Hazardous Waste Landfills - Site Selection, Design and Operation. Biomedical, Plastic and E-Waste - Waste Categorization, Generation, Collection, Transport, Treatment and Disposal.

References:

- Handbook of Solid Waste Management, F. Kreith, G. Tchobanoglous, 2009.
- CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000.
- Pollution Control, Climate Change and Industrial Disasters, Abbasi, T. and Abbasi, S.A. Discovery Publishing House, New Delhi (2010).
- Hazardous Waste Management, M. D. LaGrega, P. L Buckingham, J. C. Evans, 2nd edition. McGraw-Hill, 2011.

7. Environmental Impact Assessment and Audit

L T P: 3-1-0 **Credit: 3**

UNIT-I

Environmental Impact Assessment **10**

EIA Origin, Concepts, Methodologies, Screening, Scoping, Base Line Studies, Mitigation, Matrices and Check list. Types of EIA - Rapid & Comprehensive, Legislative and Environmental Clearance Procedures in India, Prediction Tools for EIA. Documentation of EIA, Environmental Management Plan, Post Project Monitoring, Case Studies in EIA.

UNIT-II

Environmental Audit **12**

Guidelines for Environmental Audit, Environmental Auditing Procedure, Matrix Method and Batelle Method of Auditing, Restoration, Rehabilitation and Reclamation Ecology Concept, Urban and Rural Planning, Land-use Pattern and Policy for India, Impact of Special Economic Zones on Environment.

UNIT-III

Environmental Management Systems **10**

Environmental Management, Problems and Strategies, Multidisciplinary Environmental Strategies, Planning, Decision- making and Management Dimensions. Elements of LCA - Life Cycle Costing - Eco Labelling.

UNIT-IV

ISO Certification **8**

Need of Certification, ISO Principles; ISO: 14000, Legal and Regulatory Concerns, Difference between ISO 9000 & ISO 14000.

References:

1. Complete Guide to ISO 14000, R. B. Clements. Simon & Schuster, 2011.
2. Environmental Management: Principles & Practices, Christopher J. Barrow, Routledge, 1999 - Business & Economics
3. Handbook of Environmental Impact Assessment Vol. I and II, J. Petts, Blackwell Science, London, 2010.
4. Canter R.L., Environmental Impact Assessment, Mc Graw Hill International Edition, 1997
5. John G. Rau and David C. Wooten (Ed), Environmental Impact Analysis Handbook, McGraw Hill Book Company.

ELECTIVES

1. Energy Audits

L T P: 3-1-0 **Credit: 3**

UNIT-I

Introduction **8**

Energy Audit Concepts, Audit - Types and Methodology, Measuring Energy Supply and Usages, Elements of Measurements, Energy Efficiency, Bureau of Energy Efficiency.

UNIT-II

Energy Auditing **12**

Benchmarking and Energy Performance; Matching Energy Usage to Requirement, Fuel and Energy Substitution; Energy Audit Instruments; Duties and Responsibilities of Energy Auditors. Material and Energy Balances, The Sankey Diagram and its Use, Process Flow Chart, Evaluation of Energy Conserving OpportUNITies, Presentation of Reports, Laboratory Work.

UNIT-III
Energy Action Planning **12**

Key elements, Force field analysis, Energy policy purpose, perspective, Contents, Formulation, Ratification, Organizing - location of energy management, Top management support, Managerial function, Roles and responsibilities of energy manager, Accountability. Motivating-motivation of employees, Information system designing barriers, Strategies, Marketing and communicating-training and planning.

UNIT-IV

Energy Management **8**

Definition & Objective of Energy Management, Understanding Energy Costs, Different Energy Scenarios, Energy Monitoring & Targeting, Maximizing Energy Efficiency.

References:

1. Guide Book for Energy Managers/Auditors by Bureau of Energy Efficiency (BEE) Published on website (ww.beeeindia.in) by Ministry of Power, Govt. of India.
2. Energy Auditing made simple by P. Balasubramanian, Separation Engineers Pvt. Ltd., Chennai.
3. Handbook of Energy Audits by Albert Thumann and William J. Younger, Fairmont Press, 2003.

2. Science of Climate Change

L T P: 3-1-0 **Credit: 3**

UNIT-I

Weather and Climate **10**

Structure, composition and dynamics of the atmosphere. Pressure, temperature, humidity, clouds, precipitation, evaporation. General circulation, Hadley cells, prevailing winds and weather. Ocean circulation and El Niño events. Difference between Weather & Climate

UNIT-II

Green House Effect **10**

Earth Energy Budget, Green House Gases – Water Vapor, Carbon Di Oxide, Methane and Others, History of Green House Theory, Natural Green House Effect, Role of Different Green House Gases. Emission of Different Green House Gases – Natural and Anthropogenic

UNIT-III

Environmental Consequences of Global Warming **10**

Melting and Disintegration of Glaciers, Rising Sea Levels, Extreme Weather Conditions – Rain, Hurricanes, Floods, Heat Waves and Droughts. Shifting of Climate Zones, Ocean Acidification, and Rehabilitation

UNIT-IV

Climate Change Mitigation **10**

Use of Renewable Energy Sources, Energy Efficiency and Conservation, Fuel Switching, Carbon Capture & Storage, Govt. Policies for Mitigation – Current Status & Future Planning, National & International Initiative.

References:

1. Sedimentology and Stratigraphy, Second Edition, Gary Nichols, A John Wiley & Sons, Ltd., Publication
2. Climate Change 1995: The Science of Climate Change, John Theodore Houghton, Intergovernmental Panel on Climate Change, Cambridge University Press, 06-Jun-1996
3. Climate Change Science & Policy, Stephen H. Schneider, Armin Rosencranz, Michael D. Mastrandrea, Island Press, 14-Dec-2009.

3.Remote Sensing & GIS

L T P: 3-1-0 **Credit: 3**

UNIT-I

Introduction **10**

Definition, Electromagnetic Radiation, Electromagnetic Spectrum, Interaction with the Atmosphere, Radiation Target, Passive & Active Remote Sensing.

UNIT-II

Remote Sensing **10**

Principles of Remote Sensing and Aerial Photo, Interpretation, Satellite based Remote Sensing and Digital Image Processing and Interpretation, Platforms and RS Data Acquisition Systems, Microwave Thermal Remote Sensing.

UNIT-III

Principles of Geographical Information Systems **10**

Theory of GIS, Geographic Information and Spatial Data Types, Hardware and Software, Steps of Spatial Data Handling, Database Management Systems, Geo Referencing, Data Quality, Data Visualization.

UNIT-IV

Remote Sensing Application in Environmental Science **10**

Agriculture and Soils, Forestry, Geosciences, Geology and Water Resources, Land Use Application, Environmental Analysis and Managements, Marine Science, Human Settlement Analysis.

References:

1. Girard, Michel-Claude, and Girard, Colette M. 2003. Processing of Remote Sensing Data. New Delhi: Oxford & IBH Publishing Co. Pvt. Ltd.
2. Hord, R. Michae l. 1986. Remote Sensing – Methods and Applications. (A Wiley-Interscience Publicat ion). New York: John Wiley & Sons
3. Bernhardensen, Tor. 1999. Geographic Information Systems: An Introduction. Toronto: John Wiley & Sons, Inc.
4. DeMers, Michael N. 2000. Fundamentals of Geographic Information Systems (2n d Ed.) (Wiley Student Edit ion). New York: John Wiley & Sons, Inc.

OPEN ELECTIVE

1. Environmental Biotechnology

L T P: 3-1-0 **Credit: 3**

UNIT-I

Introduction **10**

Definition & Significance, Toxic Chemicals in the Environment, Pesticides and its Biochemical Aspects, Mode of Entry on Toxic Substance, Biotransformation of Xenobiotics.

UNIT-II

Applications of Environmental Biotechnology **10**

Biogas Technology, Biotransformation, Fermentation Technology, Bio Remediation, Phyto Remediation, Bio Monitoring, Vermicomposting, Micro Biology of Water, Air & Soil.

UNIT-III

Environmental Biochemistry **10**

Photosynthesis and Respiration; Important Biological Compounds; Enzymes; Microbiological Concepts; Cells, Classification and Characteristics of Living Organisms, Characterization Techniques; Reproduction, Metabolism, Microbial Growth Kinetics.

UNIT-IV

Biotechnology for Waste Water Treatment **10**

Biological Processes for Domestic and Industrial Waste Water Treatments; Aerobic Systems - Activated Sludge Process, Trickling Filters, Biological Filters, Rotating Biological Contractors (RBC), Fluidized Bed Reactor (FBR), Expanded Bed Reactor, Inverse Fluidized Bed Biofilm Reactor (IFBBR), Packed Bed Reactors Air- Sparged Reactors, Anaerobic Biological Treatment - Contact Digesters, Packed Column Reactors, UASB.

References:

1. Environmental Biotechnology: Concepts and Applications, Hans-Joachim Jordening, Josef Winter John Wiley & Sons, 2006.
2. Environmental Biotechnology: Theory and Applications Gareth M. Evans, Judith C. Furlong, J. Wiley, 2003.

2. Biodiversity & Conservation

L T P: 3-1-0 **Credit: 3**

UNIT-I

Introduction **10**

Definition, Concepts of Bio Diversity, Species Diversity, Ecosystem Diversity, Genetic Diversity, Distribution, Evolutionary Diversification.

UNIT-II

Variation & Diversity **10**

Measuring Biodiversity, Species, Abundance, Adaptation, Distribution, Natural Selection. Geographical Diversity - Competition and CommUNITy Structure, Local regional Diversity relationships, Low Diversity, Extreme of High and Low Diversity.

UNIT-III

Flora Conservation **10**

Forest Types, Conservation of Forests, Management of Forest and Forest Resources Agro Forestry Social Forestry. Biomes – Forest, Grassland, Desert, Tundra, Autorotation and Deforestation.

UNIT-IV

Conservation of Wild Life **10**

Aims, Objectives, Species Extinction, Endangered Species. Animal Sanctuaries, National Parks, Conservation of Wild Life, UNESCO, WHO, Convention, In-situ- Ex-situ Conservation, Man and Biosphere Conservation Programmes.

References:

1. Erach Bharucha, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad –380 013, India
2. Heywood, V.H & Waston, R.T. 1995. Global Biodiversity Assessment. CambridgeUniv. Press 1140p.**0020**

M.Tech.

in

Nanoscience and Technology

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2012-13)

Research and Technology Development Centre
SHARDA UNIVERSITY

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SUMMARY SHEET

Centre:	Research and Technology Development Centre	
Name of the Course:	M. Tech. in Nanoscience and Technology	
Duration:	Two years	
Total number of Credits:	66	
Date of Meeting of BOS:	July 12, 2012	
Members of BOS:	1. Dr.S.K.Mishra	Chairman
	2. Prof. V.D.Vankar, IIT Delhi	Ext. Member
	3. Prof. A.P.Gupta, Tech.Univ.,Delhi	Ext. Member
	4. Dr.D.N.Singh, Indosolar,G.Noida	Ext. Member
	5. Dr.G.R.Niyati, Moserbaer, G.Noida	Ext. Member
	6. Dr.Akhilesh Gupta, DST,New Delhi	Ext. Member
	7. Prof. N.B.Singh	Int. Member
	8. Dr.P.K.Singh	Int. Member
	9. Dr.Rajesh Kumar	Spl. Invitee
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

CREDITS DISTRIBUTION OF M.TECH. NANOSCIENCE AND TECHNOLOGY

SEMESTER	Courses (L-T-P)							Lecture	Contact Hr/Week				Credits
									L	T	P	Total	
I	Quantum Mechanics (3-1-0) 4	Thermodynamics and Phase Transformations in Solids (3-1-0) 4	Physics and chemistry of Materials (3-0-0) 3	Nanomaterials and their synthesis (3-0-0) 3	Elective-1 (3-0-0) 3	Foreign Language (1-0-2)2	Practical (0-0-4)2	**6**	**16**	**2**	**6**	**24**	**21**
II	Characterization Techniques of nanomaterials (3-0-0) 3	Properties of nanomaterials (3-0-0) 3	Thin Films Technology (3-0-0) 3	Elective-2 (3-0-0) 3	Open Elective (3-0-0) 3	Technical Communication (1-0-2)2	Practical (0-0-4)2	**6**	**16**	**0**	**6**	**22**	**19**
III	Project 4	Seminar 2	Dissertation 8					**-**	**-**	**-**	**-**		**14**
IV	Dissertation 12							**-**	**-**	**-**	**-**	**-**	**12**
Total								**12**	**32**	**2**	**12**	**46**	**66**

L-lecture, T-tutorial, P-practical

Total Credits: 66

* Department is free to decide the number of core and elective courses with at least one open elective and a minimum of core courses of 12 credits and can have as many courses with tutorials as it wants with a restriction that overall credits will not be less than 64 and not more than 68. The total credits in 1st and 2nd semester may range from 38 to 42

LIST OF DEPARTMENTAL ELECTIVES

1. Carbon nanotubes
2. Nanocasting
3. Nanostructure and Fast Ion conducting Solids
4. Nanocomposites
5. Nanosensors
6. Biophotonics

LIST OF OPEN ELECTIVES

1. Nanoscience of cementitious systems
2. Nanotechnology for energy systems
3. Nanotechnology in Medical Sciences

M.Tech.

in

Nanoscience and Technology

SYLLABI

NST 116: Quantum mechanics

L T P: 3-1-0 **Credit: 4**

UNIT-I

The Physical basis of quantum mechanics **12**

Limitation of classical physics – Planck's quantum hypothesis, Photoelectric effect, Compton effect, De Broglie hypothesis, Wave particle duality, Davission Germer Experiment, Uncertainty Principle, complimentarity.

Wave Mechanics

Postulates of Quantum mechanics, Physical interpretation of wave function, observables, Eigenfunctions and eigenvalues, Probability density and conservation of probability, Expectation values and Quantum numbers, Ehrenfest,s theorem, orthogonality of Eigenfunction and superposition of states.

UNIT -II

Behaviour of Electrons **12**

Schrodinger equation, Free particle wave function, Particle in one dimensional Box, Square well, Rectangular potential barrier, Linear harmonic oscillator, Rigid rotator, Spherically symmetric potential-Hydrogen atom.

Matrix Mechanics and angular Momentum.

Linear operators, Eigenvalues equation, Hermitian operators, Bra and ket notation, Matrix solution to the simple harmonic oscillator problem, Angular momentum-connection with rotation, Differential operator representation, Choice of L^2 , Lz.

UNIT –III

Approximation Methods and Variational Techniques **10**

WKB Approximation – one dimensional potential barrier, Perturbation: Time independent perturbation theory (Non-degenerate and degenerate states), Some applications to atomic physics; LS coupling, Zeeman Effect, Stark effect, Time dependent perturbation theory, Adiabatic perturbation, Periodic perturbation, Atoms in radiating field.

UNIT -IV

Energy calculations **06**

Variational Techniques, Ground state energy, Ground state of Helium, Hydrogen molecular ion, Variational calculation of phase shift, Hartree Method.

References

1. Modern Physics - Beiser , sixth edition (2003), McGraw-Hill
2. Quantum Mechanics - Bransden and Joachen, second edition, (2000),
3. Basic Quantum Physics – A. Ghatak (2009) ISBN 0-230-63916-X
4. Principles of Quantum Mechanics - R. Shankar, 2nd ed. (1994)
5. Advanced Quantum Mechanics- J.J. Sakurai, 1994, Addison-Wesley
6. Quantum Mechanics- Pauling & Wilson, (1985), John Wiley and Sons

NST 109: Thermodynamics and phase transformation in solids

T P: 3-1-0 **Credit: 4**

UNIT-I

Thermodynamic Laws and thermodynamic equations **10**

Thermodynamic Terms and Concepts, Laws of Thermodynamics**,** The second law of thermodynamics - the second law and the definition of entropy, Reversible and irreversible processes, Conditions for equilibrium and the definition of Helmholtz and Gibbs free energies, Maximum work, The variation of entropy with temperature, The third law of thermodynamics and entropy, Maxwell relations, Clapeyron and Clausius-Clapeyron equations, Solution thermodynamics - Ideal and regular solutions, Raoult's law activity, Gibbs-Duhem equation, Partial molar properties, Partial excess properties.

UNIT-II

Statistical and Irreversible Thermodynamics **10**

Statistical thermodynamics - Some Common Terms and Basic Concepts of Statistical Thermodynamics, The Partition Functions, Concept of Entropy in Irreversible Processes, Thermodynamic Fluxes and Forces, Relation between Straight and Cross Phenomenological Coefficients, Onsager's Law: The Onsager's Reciprocal Relationship.

UNIT-III

Phase Diagrams **12**

The Gibbs Phase Rule and Phase Diagrams, Phase diagram of one component system eg. Water and Phase Diagram of Carbon, Phase Equilibria in Two Component Systems, Methods for the Study of Phase Diagrams of Condensed (solid – liquid) Systems. Simple Binary Eutectic Phase Diagram (Pb-Ag and Bi-Cd System), Phase Diagram showing Congruent Melting Point (Zn-Mg System), Phase diagram of iron-carbon system, Phase Diagram showing Incongruent Melting Point, or Peritectic Point, Monotectic Type Phase Diagram, Ternary phase diagrams, Phase diagrams of Al_2O_3-Cr_2O_3, MgO-Al_2O_3 and SiO_2-Al_2O_3.

UNIT-IV

Phase Transformations **8**

Phase-Transformations in Solids, Classifications of Phase Transitions, Martensitic Transformations, Order – Disorder Transitions, Techniques for the Study of Phase Transformations, Kinetics of phase transitions, Nucleation process during phase transitions, Solid solutions, Hume Rothery rules.

References

1. Thermodynamics and Statistical Mechanics - A N Tikhonov, Peter T Landberg, Peter Theodore Landsberg, 1991, Dover Publication
2. Statistical Mechanics - Landau & Lifshitz , Vol. 5 (2000)
3. Atkins Physical Chemistry – Peter Atkins and Julio de Paula, Ninth Edition, (2009)
4. Fundamental of statistical & thermal Physics – F. Reif (1965)
5. An Introduction to Chemical Thermodynamics by R.P.Rastogi and R.R.Mishra (2007)
6. Introduction to Non-equilibrium Physical Chemistry by R. P. Rastogi, Elsevier (2008)
7. Reif, F. Fundamentals of Statistical and Thermal Physics (McGraw-Hill, 1965)
8. Statistical Mechanics, 3rd edition (Addison-Wesley, 1975).

ST 117: Physics and Chemistry of Materials

T P: 3-0-0 **Credit: 3**

UNIT-I

Introduction to solids **10**

Crystalline and amorphous solids, Translational symmetry, Elementary ideas about crystal structure, Lattice, UNIT cell, Reciprocal lattice, Fundamental types of lattices, Miller indices, Lattice planes, Simple cubic, f.c.c. and b.c.c. lattices. Laue and Bragg equations. Close packing of atoms, Voids in closest packings, Radius ratio rule, Structure of ionic Crystals, Ionic Crystals with stoichiometry MX, Ionic Crystals with stoichiometry MX_2,Spinel structure, Perovskite structure.

UNIT-II

Bonding in solids and band structure **10**

Different types of bonding- ionic, covalent, metallic, van der Waals and hydrogen. Band theory of solids, Periodic potential and Bloch theorem, Kronig-Penny model, Brillouin Zones, Energy band structure. Band structure in conductors, Direct and indirect semiconductors and insulators (qualitative discussions); Free electron theory of metals, Effective mass, Drift current, Mobility and conductivity, Wiedemann-Franz law, Hall effect in metals, Phenomenology and implication.

UNIT-III

Crystal Defects and non-stoichiometry **8**

Classification of Defects: subatomic,atomic and lattice defects in solids, Thermodynamics of vacancy in metals, Thermodynamics of Schottky defects in ionic solids , Thermodynamics of Frenkel defects in silver halides, Calculation of number of defects and average energy required for defect, Other examples of defect structure, Non-stoichiometry and its classifications.

UNIT-IV

Diffusion in Solids **12**

Mechanisms; Fick's laws, Factors-affecting diffusion in metals, Ceramics and semiconductors, Atom mobilities, Temperature and impurity dependence of diffusion, Various diffusion processes, Heat Transport: conduction, convection, radiation, Momentum transport: viscosity, measuring viscosity, rheology, etc.

Solid State Reactions

General Principles, Experimental procedure, Co-precipitation as precursor to solid-state reactions, Kinetics of solid-state reactions.

References

1. Solid state chemistry by N.B.Hanny (1976)
2. Introduction to Solid State Physics by C. Kittel, 7th Edition, John –Wiley & Sons Pvt Ltd., New Delhi, 1996.

NST 118: Nanomaterials and their Synthesis

LT P: 3-0-0 **Credit: 3**

UNIT – I

Introduction to Nanomaterials **10**

Introduction to nanomaterials, Definition, Conceptual origins, Fundamental concepts- Larger to smaller: a materials perspective, Simple to complex: a molecular perspective, Four Main Stages of Progress in Nanotechnology-Passive nanostructures, Active nanodevices, Complex nanomachines, Systems of nanosystems/Productive nanosystems , Molecular nanotechnology, Nanomaterials :Bottom-up approaches, Top-down approaches, Functional approaches, Biomimetic approaches.

UNIT-II

Properties of nanomaterials and quantum dots **10**

Nanoscience and nanotechnology in ancient India, Classification of nanostructured materials, Properties of nanostructured materials: Size and surface dependence of physical, electronic, optical, thermodynamical, magnetic, catalytic, gas sensing and mechanical properties, Concept of quantum dots. Tools and Techniques in Nanotechnology.

UNIT-III

Synthesis of nanomaterials **10**

Preparation of nanomaterials by Ball milling, Attrition and Vibration milling, Chemical precipitation and co-precipitation, Metal nanocrystals by reduction, Sol-gel synthesis, Microemulsions or reverse micelles, Hydrothermal & Solvothermal synthesis, Thermolysis routes, Microwave heating synthesis, Sonochemical synthesis; Electrochemical synthesis, Melting and rapid quenching techniques.

UNIT-IV

Synthesis of special nanomaterials **10**

Semiconductor nanoparticles Synthesis – Cluster compounds, Quantum-dots from MBE and CVD, Wet chemical methods, Electro-deposition, Pyrolytic synthesis, Semiconductor nanowires-Fabrication strategies, Quantum conductance effects in semiconductor nanowires, Porous Silicon, Nanobelts, Nanoribbons, Nanosprings. Preparation of nano particles of ZnO, Al_2O_3, ZrO_2, SiC, Preparation of nanostructured polymers/Conducting polymers.

References

1. Encyclopedia of Nanoscience and Nanotechnology by Hari Singh Nalwa, Vol 1-10 (2003)
2. Introduction to Nanotechnology - Charles P. Poole Jr. and Franks. J. Qwen (2004)
3. Guozhong Cao ,"Nanostructures and Nanomaterials , synthesis , properties and applications" , Imperial College Press ,2004.
4. Pradeep T. , "NANO The Essential , understanding Nanoscience and Nanotechnology". Tata McGraw-Hill Publishing Company Limited , 2007.
5. Charles P.Poole Jr. "Introduction to Nanotechnology", John Willey & Sons , 2003.
6. Masuo Hosokawa, Kiyoshi Nogi, Makio Naito, Toyokazu Yokoyama Nanoparticle Technology Handbook, Elsevier Publishers (2007)
7. Synthesis, properties and applications by CNR Rao et.al.2002
8. Nanochemistry: A Chemical Approach to Nanomaterials – Royal Society of Chemistry, Cambridge, UK,,2005

NST 119: Characterization Techniques of Nanomaterials

LT P: 3-0-0 **Credit: 3**

UNIT-I

SPM techniques **10**

Scanning probe microscopic (SPM) Techniques: Scanning Electron Microscopy, Scanning tunneling microscopy (STM), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy(TEM),

UNIT-II

Microscopic Techniques **10**

Electrostatic force microscopy, Ballistic electron emission microscopy, Magnetic force microscopy, Atomic force microscopy (AFM), In-situ Environmental Transmission Electron Microscopy, Electron Tomography.

UNIT-III

Spectroscopic Techniques **12**

UV-visible, FT-IR, Raman and Atomic absorption spectroscopy,

X-ray diffraction, Debye-Scherer formula, Dislocation density, Micro strain, X-ray photoelectron spectroscopy (XPS), Electron Energy-loss Spectroscopy, Energy Dispersive X-ray Analysis (EDXA), X-ray fluroscence, AUGER Spectroscopy

UNIT-IV

Solid State methods **8**

Conductivity measurement, Dielectric measurement, Thermogravimetry/Differential Thromogravimetry/Differential Scanning Calorimetry/Differential Thermal Analysis.

References

1. Introduction to Nanotechnology - Charles P. Poole Jr. and Franks. J. Qwens (Wiley Interscience, 2003)
2. Processing & properties of structural nano materials by Leon L. Shaw (Warrendale, 2003)
3. Chemistry of nanomaterials: Synthesis, properties and applications by CNR Rao (Taylor & Francis 2008)
4. Nanocharacterization - Argus Kirkland and John L Hutchison (RSC publication, 2007)

NST 113: Properties of nanomaterials

LT P: 3-0-0 **Credit: 3**

UNIT-I

Mechanical Properties **10**

Stress Strain diagram for different engineering materials, Engineering and true stress strain diagram, Ductile and brittle material, Tensile strength, Hardness, Impact strength, Fatigue, Creep, Fracture (Types and Ductile to brittle transition), Factors affecting mechanical properties.

UNIT-II

Magnetic properties of materials **12**

Terms and definitions used in magnetism, Classification of magnetic materials, Theory of diamagnetism, Langevin theory of paramagnetism, Weiss theory, Paramagnetic susceptibility of a solid, Ferromagnetism, Spontaneous magnetization in ferromagnetic materials, Curie-Weiss law, Antiferromagnetism , Ferrimagnetism, Structure of Ferrite.

Dynamics of Nanomagnets, Nanopore containment of magnetic properties, Nanocarbon ferromagnets.

UNIT-III

Dielectric properties **8**

Dielectric Materials: Basic concepts - Langevin's Theory of Polarization, Clausius-Mossotti Relation, Ferroelectricity, Piezoelectricity, Properties of Dielectric in alternating fields, Piezoelectric and pyroelectric effects.

UNIT-IV

Optical properties of solids **10**

Optical Properties: Refractive index and dispersion, Transmission, Reflection and absorption of light, Optical material for UV and IR, Optics of anisotropic crystals: biaxial, uniaxial crystals, double refraction, index ellipsoid, optical activity, Non-linear optical crystals, Photonic band gap (PBG) materials, Growth of PBG materials, Light transmission in PBG materials, Application of PBG materials.

Absorption processes- Photoconductivity, Photoelectric effect, Photovoltaic effect, Photoluminescene

References

1. Mechanical Metallurgy', 3rd Edition, McGraw Hill,by G. E. Dieter, 1988
2. Testing of Metallic Materials', Prentice Hall India,by Suryanarayana, *1979.*
3. Structure and Properties of Materials', Volume III,by R. M., Rose Shepard L. A., Wulff J.,4th Edition, John Wiley, 1984
4. Introduction to Magnetic Materials, Addison-Wesley Publications, California, London, by B. D. Cullity, 1972
5. Magnetism and Magnetic Materials, Institute of Materials, London, by J. P. Jakubovics 1994
6. Introduction to Magnetism and Magnetic Materials, Chapman & Hall,by D. Jiles 1991
7. Solid State Physics: Structure and Properties of Materials, , 2nd Editionby A.M.Wahab, Narosa Publishing house, New Delhi, India, 2007.
8. Elementary Solid State Physics: Principles and Applications by M.A.Omar, 4th Edition, Pearson Education Pvt. Ltd., Delhi, India, 2004.
9. Introduction to Solid State Physics by C. Kittel, 7th Edition, John –Wiley & Sons Pvt Ltd., New Delhi, 1996.
10. Yang S and.Shen P: "Physics and Chemistry of Nanostructured Materials", Taylor & Francis, 2000.

NST 006: Thin Films Technology

LT P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **10**

Introduction and historical background of thin films, Preparation of Thin Film: Physical vapor deposition (PVD) process, Vacuum deposition, Thermal deposition, Sputter method, Arc vapor deposition, Pulse laser deposition, Chemical vapor deposition (CVD) processes.

Evaporation theories- vapour sources, Substrates and patterns in thin films, Deposition of alloys and compounds, DSeposition monitoring and control.

UNIT-II

Theory of thin film formation and vacuum pumps **10**

Nature of thin films: Theories of nucleation- the capillarity and the atomistic model, Growth processes, Effects of deposition parameters, Structure of films, DSefects in thin films.
Vacuum Technology: Vacuum pumps-Rotary mechanical pump, Diffusion pump, Turbomolecular pump, Sputter ion pump.

UNIT-III

Properties of thin films **10**

Mechanical properties of thin films: adhesion, stress, strain, tensile properties .
Electrical conduction in discontinuous and continuous metal and semiconducting films, Theories of size effect, Galvanomagnetic size effect, Optical properties of thin film: optical constants, reflectance, transmittance and absorbance.

UNIT-IV

Magnetic and surface properties of thin films **10**

Magnetism in thin metal films, ferromagnetic and antiferromagnetic properties of thin films, Surfaces and interfaces of ferromagnetic metals, Spin dependent current, Some thin film magnetic devices.
Film thickness measurement: optical interference methods and other methods, Analytical techniques for chemical, structural and surface studies.

References:

1. Handbook of thin film technology, eds. L.I.Maissel and R. Glang, 1970
2. Thin Film Phenomena, by K.L.Chopra, 1969
3. D.L.Smith, Thin Film Deposition, Principle and Practice,McGraw Hill, 1955.
4. Milton Ohring, The Materials Science of thin films, Academic Press Ltd.,UK, 1992.
5. K. N. Tu, J. W. Mayer, and L. C. Feldman, Electronic Thin Film Science (Macmillan,NJ, 2000).

ELECTIVES

NST 008: Carbon Nanotubes

LT P: 3-0-0 **Credit: 3**

UNIT – I

Important Carbon based materials **10**

Fullerenes-Introduction, Preparation and Characterization and applications of Fullerene and other associated carbon clusters/molecules, Graphene - preparation, characterization and properties, nanodiamonds.

UNIT-II

Carbon nanotubes **10**

Introduction, Preparation of carbon nanotubes by arc discharge, laser ablation, CVD and other techniques, properties of carbon nanotubes – electrical, optical, mechanical and magnetic properties, applications of carbon nanotubes – field emission, fuel cells, drug delivery, etc.

UNIT – III

Functionalization of carbon nanotubes **15**

Covalent functionalization, Defect Functionalization - transformation and modification of carboxylic functionalizing groups like amides, thiolines, halogens and hydrogen.

Sidewall functionalization through addition of electrophillic and nucleophilic groups like carbenes and nitrenes, non-covalent exoherdal functionalization, endoherdal functionalization.

UNIT-IV

Devices **5**

Carbon nanotube drug delivery, Sensors for medical diagnostics, CNT transitors

References

1. Carbon Nanotubes: Properties & Applications, by Michael J. O'Connell, CRC/Taylor & Francis,2006
2. Carbon Nanotechnology by Liming Dai, Elsevier: Amsterdam, 2006
3. Nanotubes & Nanowires by CNR Rao & A Govindaraj, RCS Publishing
4. Physical properties of Carbon Nanotubes by R. Satio ,Imperial College Press, 1998
5. Synthesis Functionalization & Surface treatment of nanoparticles by Marie Isabelle Baraton, Amer Scientific Pub, 2002
6. Applied Physics of Carbon Nanotubes : Fundamental Theory, Optics & Transport Devices by S. Subromany & S. V. Rotkins, Springer, 2005

NST 009: Nanocasting

LT P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **10**

Nanocasting concept, Ordered mesoporous materials, Nanocasting process- principle, templates, influence of template structure, Templates with 2-D porous channels, Templates with cage-like pores, Templates with 3-D Helix channels, Analysis and characterization of nanocast mesoporous solids.

UNIT-II

Nanocast materials **10**

Micro, Meso, Macroporous nanocast carbons: Introduction and methods of preparation, Ordered and disordered nanocast mesoporous carbons, Morphology of nanocast carbons-sphere, rod, thin film, Monolith, etc., Crystallinity control of nanocast carbons.

Preparation and characterization of Nanocast Mesoporous Metal oxides, Sulphides, Carbides and Polymers.

UNIT-III

Zeolite and mesoporous materials **8**

Repeat nanocasting to create Zeolites, Mesoporous Silicas, Ordered mesoporous MgO, Al_2O_3, CeO_2, ZnO, CuO.

Ordered Mesoporous ceramics prepared by repeat nanocasting- Boron nitrides, SiC and SiN ceramics.

UNIT-IV

Functionalization and applications **12**

Functionalization and applications of nanocast porous solids: General strategies for functionalization of porous solids, Functionalization of nanocast porous solids-Magnetic functionalization, introduction of catalytically active metal species, oxidation of nanocast porous carbons, introduction of nitrogen containing groups, introduction of organic functional groups.

Application of nanocast porous solids- Energy storage and conversion, catalysis, adsorption and separation, gas storage, other fields

References

1. Nanocasting-An-Hui Lu, Dongyuan Zhao and Ying Wan (RSC publication, 2009)

NST 010: Nanostructure and Fast ion conducting solids

LT P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **8**

Solid state ionics, charge carriers and defects, classification of fast ion conductors-based on defect concentration, based on the type of mobile species, based on composition and microstructures.

UNIT-II

Nanoionics and transport phenomena **12**

Nanoionics: (I) nanosystems based on solids with low ionic conductivity, and (II) nanosystems based on advanced superionic conductors.

Transport phenomena: Space charge layer model, Effective medium approach, Adsorption-Desorption model, Resistor network model, Ion hopping mechanism.

UNIT-III

Ion conducting Materials **8**

Ion conducting materials: Single ion conducting materials, Divalent ion conductors, Proton Conductors, Gels, Nanocomposits, Polymer electrolytes, Ceramics, Nanoionic materials.

UNIT-IV

Glassy State **12**

Glasses,Thermodynamics of nucleation and growth of nanocrystallites in glassy systems, Conducting glasses, Ion conduction in glasses,

Glasses for ferroics, spintronics, and photonics, Glass batteries, Glass sensors.

Applications of Fast ion conducting solids: Batteries, Sensors, Fuel cells, Solar cells.

References

1.S.Chandra, Superionic solids-Principles and applications, North Holland,m Amasterdam, 1981
2. S.Geller, Solid electrolytes, Springer-Verlag, Berlin,1977
3. B. Scrosati, Fast Ion Transport in Solids, Kluwer Pub., 1993
4. Irving Tepper, Solid State Devices: Applications, Addison-Wesley Publishing Company, 1974

NST 115: Nanocomposites

LT P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **10**

Nanocomposites: An Introduction, Types of Nanocomposite, Core-Shell structured nanocomposites, Superhard Nanocomposite. Metal based nanocomposites- Metal -Ceramic nano composites, Metal-metal nanocomposites,

UNIT-II

Preparation of nanocomposites **10**

Different aspects of their preparation techniques, Properties and functionality, Electrical and magnetic properties of nanocomposites.

UNIT-III

Polymer nanocomposites **10**

Polymer based nanocomposites- Preparation and characterization: Direct Mixing, Solution Mixing, In-Situ Polymerization, In-Situ Processing of Ceramic/Polymer and Metal/Polymer nanocomposites, Polymer-carbon nanotubes based composites. Properties and industrial applications of polymer based nano composites.

UNIT-IV

Fractal based and bionanocomposites **10**

New kind of nanocomposites: Fractal based glass-metal nanocomposites, its designing and fractal dimension analysis. Electrical property of fractal based nanocomposites.

Nanocomposite biomaterials, teeth and bone substitution, Natural nanocomposite systems as spider silk, bones, shells; organic-inorganic nanocomposite formation through self-assembly, Biomimetic synthesis of nanocomposite material.

References

1. Nanocomposites Science and Technology - P. M. Ajayan, L.S. Schadler, P. V. Braun (2003)
2. Physical Properties of Carbon Nanotubes- R. Saito (1998)
3. Carbon Nanotubes (Carbon , Vol 33) - M. Endo, S. Iijima, M.S. Dresselhaus
4. The search for novel, superhard materials- Stan Vepr¡ek (Review Article) JVST A, 1999
5. Electromagnetic and magnetic properties of multi component metal oxides, hetero Nanometer versus micrometer-sized particles-Christian Brosseau,Jamal Ben, Youssef, Philippe Talbot, Anne-Marie Konn, (Review Article) J. Appl. Phys, Vol 93, 2003
6. Diblock Copolymer, - Aviram (Review Article), Nature, 2002
7. Handbook of Nanostructured Biomaterials and Their Applications in Nanobiotechnology - Hari Singh Nalwa (2005)
8. Nanobiotechnology:Concepts, Applications and Perspectives, Volume 1 by Christof M. Niemeyer, Chad A. Mirkin (2004)

NST 017: Nanosensors

LT P: 3-0-0 **Credit: 3**

UNIT- I

Sensor characteristics and physical effects **10**

Active and Passive sensors, Static characteristic, Accuracy, offset and linearity, Dynamic characteristic, First and second order sensors, Physical effects involved in signal transduction, Photoelectric effect.

UNIT-II

Nano based inorganic sensors **10**

Density of states (DOS) – DOS of 3D, 2D, 1D and 0D materials, one dimensional gas sensors: gas sensing with nanostructured thin films, absorption on surfaces, metal oxide modifications by additives, surface modifications, Nano optical sensors, Nano mechanical sensors, Plasmon resonance sensors with nano particles, AMR, Giant and colossal magnetoresistors, Magnetic tunneling junctions.

UNIT-III

Organic /Biosensors **10**

Structure of Protein, role of protein in nanotechnology, using protein in nanodevices, antibodies in sensing, antibody in nano particle conjugates, enzymes in sensing, enzyme nanoparticle hybrid sensors, Motor proteins in sensing, Transmembrane sensors, Nanosensors based on Nucleotides and DNA, Structure of DNA, DNA decoders and microarrays, DNA protein conjugate based sensors, Bioelectronic sensors, DNA sequencing with nanopores, Sensors based on molecules with dendritic architectures, biomagnetic sensors.

UNIT-IV

Applications **10**

Cantilever array sensors, Cantilever sensors for diagnosis of diabetes mellitus, Cantilever sensors for cancer diagnosis, Nano tube based sensors, Nanotube-based sensors for DNA detection, Nanotube-based sensors for capnography, Nanowire-based sensors, Nanowire based electrical detection of single viruses, Nanowire-based electrical detection of biomolecules.

References:

1. Kouroush Kalantar – Zadeh, Benjamin Fry, “Nanotechnology enabled Sensors”, Springer Verlag New York, 2007, ISBN-13: 9780387324739
2. H.Rosemary Taylor, “Data acquisition for sensor systems” (sensor physics and technology,Chapman and Hall, London,UKISBN 0 412 785609, 1997.
3. Jerome Schultz, Milar Mrksich, Sangeeta N. Bhatia, David J. Brady, Antionio J. Ricco, David R. Walt, Charles L. Wilkins,“Biosensing: International Research and Development”, Springer, 2006 ISBN 10 14020 40571, ISBN 13 978 1 4020 4057
4. Ramon Pallas-Areny, John G. Webster, “Sensors and signal conditioning” John Wiley & Sons, 2001, 2 edition ISBN 0 47133232 .

NST 018: Biophotonics

LT P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **8**

Interaction of light with cells, tissues, non-linear optical processes with intense laser beams, photo-induced effects in biological systems.

UNIT-II

Imaging Techniques **12**

Imaging techniques: Light microscopy, wide-field, laser scanning, confocal, multiphoton, fluorescence lifetime imaging, FRET imaging, Frequency-Domain lifetime imaging. Cellular Imaging, Imaging of soft and hard tissues and other biological structures.

UNIT-III

Spectroscopic Techniques **10**

Single molecule spectroscopy: UV-VIS spectroscopy of biological systems, single molecule spectra and characteristics – IR and Raman spectroscopy and Surface Enhanced Raman Spectroscopy for single molecule applications.

UNIT-IV

Optical Force Spectroscopy **10**

Generation optical forces – Optical trapping and manipulation of single molecules and cells in optical confinement - Laser trapping and dissection for biological systems - single molecule biophysics, DNA protein interactions.

Biosensors, fluorescence immuoassay, flow cytometry, Fluorescence correlation spectroscopy, Fluorophores as cellular and molecular tags.

Reference:

1. Laser Tweezers in Cell Biology in Methods in Cell Biology, Vol.55, Michael P. Sheetz (Ed.), Academic Press.
2. P.N. Prasad, Introduction to Biophotonics, John-Wiley, 2003.
3. G. Marriot & I. Parker, Methods in Enzymology, Vol.360,2003.
4. G. Marriot & I. Parker, Methods in Enzymology, Vol.361,2003.

OPEN ELECTIVE

NST 007: Nanoscience of cementitious materials

LT P: 3-0-0 **Credit: 3**

UNIT-I

Portland cement **10**

Portland cement and its major constituent phases: introduction, alite, belite, aluminate and ferrite phases, Composition, Crystal structures, Impurities and Polymorphic changes in constituent phases; Phase compositions in the system: $CaO\text{-}SiO_2$, $CaO\text{-}Al_2O_3$, $CaO\text{-}Al_2O_3\text{-}Fe_2O_3$, Reactions in clinkering processes and Manufacture of Portland cement,

UNIT-II

Preparation of nanocements **10**

Preparation of nanosilicate and nanoaluminate cements, Characterization of nanocements by X-ray diffraction and microscopic techniques. Mechanism of hydration of Portland cement and its constituents in terms of Nanoscience.

UNIT-III

Composite Cements **12**

Composite Cements and their hydration characteristics.

Nanosilica fume - cement composite – Preparation, characterization, pozzolanic reaction, hydration, microstructure and strength.

Carbon nanotube - cement composite – Preparation, characterization, hydration, microstructure and strength.

UNIT-IV

Nanostructure of hydration products **10**

Nanostructural behaviour during the hydration of cement in presence of admixtures (accelerators, retarders and superplasticizers).

Concrete- durability, Nanoscience of alkali-silica reaction, Sulphate attack, Delayed ettringite formation Gypsum plaster and its hydration in terms of Nanoscience.

Role of nanodimension metals and polymers in concrete.

Reference

1. Cement Chemistry by H.F.W.Taylor, 3rd Revised edition , ICE Publishing, 1997

OEM 002: Nanotechnology for energy systems

LT P: 3-0-0 **Credit: 3**

UNIT-I

Solar and Renewable energy Technology **10**

Sun and its radiation, Solar cells, Solar cell properties and design, efficiency, optical losses, recombination losses, solar energy and photovoltaics.

Renewable energy Technology: Energy challenges, nanomaterials and nanostructures in energy harvesting, developments and implementation of nanotechnology based renewable energy technologies, solar cell structures: quantum well and quantum dot solar cells, photo- thermal cells for solar energy harvesting, Thin film solar cells, CIGS solar cells, Dye sensitized solar cells.

UNIT-II

Hydrogen storage Technology **10**

Hydrogen production methods, purification, hydrogen storage methods and materials: metal hydrides and metal-organic framework materials, volumetric and gravimetric storage capacities, hydriding and dehydriding kinetics, high enthalphy formations and thermal management during hydriding reaction, multiple catalytic – degradation of sorption properties, automotive applications.

UNIT-III

Fuel cell Technology **10**

Fuel cell Principles, types of fuel cells (Alkaline Electrolyte, Phosphoric acid, Molten Carbonate, solid oxide and direct methanol and Proton exchange fuel cells), Principle and operation of Proton Exchange Membrane (PEM) fuel cell, Materials and fabrication methods for fuel cell technology, micro fuel cell power sources – Biofuels

UNIT-IV

Batteries **10**

Lithium Ion based batteries.

Microfluidic Technology: micro and nano engines and driving mechanism, power generation, microchannel battery pump (TCP), piezoelectric membrane and their applications.

References

1. Renewable Energy Resources by J. Twidell and T.Weir, E&FN Spon Ltd.(1986)
2. Hydrogen from Renewable Energy Source by D.Infield, Wiley, 2008
3.Fundamentals of Industrial Catalytic Process by C.H. Bartholomew and Robert J. Farraoto, John Wiley & Sons Inc.(2011)
4. R.A.Shatwell, "Fuel Storage on Board Hydrogen Storage in Carbon Nanostructures - in *Fuel* cell technology handbook", CRC Press, 2003.
5. Fuel cell Technology Handbook by Hoogers, CRC Press (2002)

NST 004: Nanotechnology in Medical Sciences

LT P: 3-0-0 **Credit: 3**

UNIT I

Nanostructured materials **10**

Introduction, Structure and its Composition, Features and Benefits**,** Use of dendrimers in therapeutics. Quantum dots: Introduction, quantum dots as agents for medical imaging, Optical properties of Quantum dot, Quantum Dots in Medical Imaging and Cancer Treatment.

Fullerenes: Basics of fullerenes, Discovery of fullerenes, Properties of fullerenes, Safety and toxicity, Fullerenes in Medical Therapeutics like Allergy, Asthma, Arthritis, and Healthcare Applications.

UNIT-II

Nanopores and nanomedicines **10**

Introduction to Nonporous materials, Nonporous membranes, Bulk Nonporous materials, Nonporous used as a single-molecule detector.

Nanomedicine: Nanodrugs, nanocapsules.

Drug delivery: Introduction, Different methods of drug delivery, Drug delivery system, drug encapsulation, Smart drugs, Biopharmaceutics and their Importance, bio MEMS (e.g. implantable devices and materials).

UNIT III

Nanobiology and nanorobotics **10**

Nanobiology: Basic Idea, Interaction between biomolecules and nanoparticle, Biological imaging using nanoparticles, applications of nanobiology.

Nanorobotics: Introduction, Strategies Employed by Nanorobots for Evading the Immune System, Nanorobots in Cancer Detection and Treatment, Mobile Cell-Repair Nanorobot, Nanonephrology and its application.

UNIT-IV

Molecular nanomachine **10**

Introduction, Covalent and Non covalent approach, Molecular motors and machines, Single Molecular Devices and their limitations.

DNA-based devices, nanotherapeutics, DNA manipulation: Basic idea about the manipulation, DNA Sequencing: High-throughput sequencing, Massively Parallel Signature Sequencing, solid sequencing, DNA nanoball sequencing.

References

1. Nanomedicine, Volume I: Basic Capabilities, by Robert A. Freitas Jr. 1999.
2. Nanotechnology in Medicine and the Biosciences, by Coombs RRH, Robinson DW. 1996.
3. Nanopores: Sensing and Fundamental Biological Interactions by Samir M. Iqbal, Rashid Bashir - 2011
4. Fullerenes*:* principles and applications by Fernando Langa, Jean- François Nierengarten, Royal Society of Chemistry (Great Britain) – 2007

Annexure-XXIV-B of Agenda Item no. 6.23

M.Tech.

in

Polymer Science and Technology

COURSE STRUCTURE & SYLLABI

(With effect from academic session 2012-13)

Research and Technology Development Centre
SHARDA UNIVERSITY

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SUMMARY SHEET

Centre:	Research and Technology Development Centre	
Name of the Course:	M. Tech. in Polymer Science and Technology	
Duration:	Two years	
Total number of Credits:	66	
Date of Meeting of BOS:	July 12, 2012	
Members of BOS:	1. Dr.S.K.Mishra	Chairman
	2. Prof. V.D.Vankar, IIT Delhi	Ext. Member
	3. Prof. A.P.Gupta, Tech.Univ.,Delhi	Ext. Member
	4. Dr.D.N.Singh, Indosolar,G.Noida	Ext. Member
	5. Dr.G.R.Niyati, Moserbaer, G.Noida	Ext. Member
	6. Dr.Akhilesh Gupta, DST,New Delhi	Ext. Member
	7. Prof. N.B.Singh	Int. Member
	8. Dr.P.K.Singh	Int. Member
	9. Dr.Rajesh Kumar	Spl. Invitee
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

CREDITS DISTRIBUTION OF M.TECH. POLYMER SCIENCE AND TECHNOLOGY

SEMESTER	Courses (L-T-P)							Lecture Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Polymer Chemistry **(3-1-0) 4**	Polymer physics **(3-1-0) 4**	Polymer process engineering **(3-0-0) 3**	Polymer Characterization **(3-0-0) 3**	**Elective (3-0-0) 3**	**Foreign Language (1-0-2)2**	Practical (0-0-4)2	**6**	**16**	**2**	**6**	**24**	**21**
II	**Plastics Technology (3-0-0) 3**	Polymer Composites **(3-0-0) 3**	Instrumentation in polymer industries **(3-0-0) 3**	**Engineering plastics (3-0-0) 3**	**Open Elective (3-0-0) 3**	**Technical Comunication (1-0-2)2**	Practical (0-0-4)2	**6**	**16**	**0**	**6**	**19**	**19**
III	**Projects 4**	**Seminar 2**	**Dissertation 8**				**-**	**-**	**-**	**-**	**-**		**14**
IV	**Dissertation 12**						**-**	**-**	**-**	**-**	**-**	**-**	**12**
Total								**12**	**32**	**2**	**12**	**43**	**66**

L-lecture, T-tutorial, P-practical

Total Credits: 66

* Department is free to decide the number of core and elective courses with at least one open elective and a minimum of core courses of 12 credits and can have as many courses with tutorials as it wants with a restriction that overall credits will not be less than 64 and not more than 68. The total credits in 1st and 2nd semester may range from 38 to 42

LIST OF DEPARTMENTAL ELECTIVES

1. Rubber Technology
2. Degradation of Polymers
3. Polymer Blends and Alloys

LIST OF OPEN ELECTIVES

1. Plastic waste management
2. Polymer Blends and Alloys
3. Polymeric Biomaterial

M.Tech.

in

Polymer Science and Technology

SYLLABI

MPT 101: Polymer Chemistry

L T P: 3-1-0 **Credit: 4**

UNIT – I

Introduction **6**

History of macromolecular science, Basic concepts of macromolecules, Degree of polymerization, Nomenclature of polymers. Classification of polymers.

UNIT-II

Molecular weight **8**

Concept of molecular weight, monodispersity and polydispersity, number average,weight average, viscosity average and sedimentation average molecular weights in polymers and their statistical equations, molecular weight distribution curve and molecular weight distribution in linear polymers (step growth and chain polymers).

UNIT – III

Polymerization and Kinetics **12**

Polymerization**:** *Step-Reaction (condensation) polymerization*: polymerization mechanisms of stepwise polymerization, kinetics of linear stepwise polymerization, polyfunctional step reaction polymerization, gelation.

Radical chain (addition) polymerization: Kinetics and Mechanism of vinyl polymerization, effect of temperature and pressure on chain polymerization.

UNIT-IV

Polymerization and Copolymerization **14**

Ionic and coordination chain (addition) polymerization: Similarities and contrasts in free radical and ionic polymerization, kinetics of cationic and anionic polymerization and Mechanism, coordination polymerization and Ziegler –Natta catalysts, ring opening polymerization.

Copolymerization: Types of copolymers(random, alternate, block and graft copolymers) Kinetics of copolymerization, mechanism of copolymerization.

References

1. F.W. Billmayer, Text Book of Polymer Science, 3rd edition, John Wiley and sons, New York, 2002.
2. V.R. Gowarikar, N.V.Viswanathan and Jayadev Sreedhav, Polymer Science, Wiley Eastern Limited, Madras 2006.
3. R.J. Young, Introduction to Polymers, Chapman and Hall Ltd., London, 1999
4. Gorge Odean – Principles of Polymerisation, 4th editon, Mc.Graw Hill Book Company, New York.2004.
5. M.S.Bhatnagar, " A Text Book of Polymers (chemistry and Technology of polymers), Vol I, II & III, 1st Edn., S.Chand and Company, Newdelhi, 2007.
6. P.J. Flory, Principles of polymer chemistry
7. R. Seymour, Introduction to polymer chemistry, Wiley –Interscience (1981)
8. D.D. Deshpande, Physical chemistry of Macromolecules Vishal publications, (1985)

MPT 102: Polymer Physics

L T P: 3-1-0 **Credit: 4**

UNIT-I

Introduction **10**

Introduction to Rheology - Newton's and Hooks laws, rheological response of materials, viscous flow- the ideal Newtonian fluid, non Newtonian Fluids, power law models. Rubber elasticity and its kinetic theory, viscoelastisity, Mechanical models – (Maxwell, Voigt –Kelvin and general purpose models) for viscoelastic materials, Relationship between stress and stain.

UNIT-II

Glassy state and morphologies **10**

The glassy state and the glass transition temperature, theoretical interpretations, effect of various parameters(molecular weight, copolymerization, plasticizer etc.) on glass transition.

Stress – strain behavior of elastomers, the mechanical properties of crystalline polymers, Structure of polymer molecules and their conformations. Crystal morphologies: extended chain crystals, chain folding, lamellae.

UNIT-III

Polymer solubility **10**

Polymer solubility: The solution process, Criteria for polymer solubility, Solubility parameters, Conformations of dissolved polymer chains, Polymer solution thermodynamics, Fractionation of polymers by solubility.

UNIT-IV

Polymer solutions **10**

The Flory–Huggins Treatment of Polymer Mixtures, Phase Diagrams: Upper and Lower Miscibility Gap, Phase Separation Mechanisms, Critical Fluctuations and Spinodal Decomposition.

Polymer Solutions: Dilute and Semi dilute Solutions, Osmotic Pressure, Screening of Excluded Volume Forces, Polyelectrolyte Solutions, Condensation and Screening of Charges, Chain Stretching, Salt Effects and Interchain Ordering, Osmotic Pressure.

Reference

1. R Gert Strobl, The Physics of Polymers, (springer, 2007)
2. F.W. Billmayer, Text Book of Polymer Science, 3rd edition, John Wiley and sons, New York, 2002.

MPT 103: Polymer process engineering

L T P: 3-0-0 **Credit: 3**

UNIT - I

Polymer processing operations **10**

Classifications of polymer processing operations. Simple model flows for analyzing processing operations with examples.

Mixing devices: Mechanical and kinetics of mixing, different types of mixing devices, two role mixing, internal mixing and screw mixing, twin screw compounding machines, high temperature and pressure mixing devices, powder coating, metalizing, antistatic agents.

UNIT-II

Moulding **10**

Injection moulding process: Components in the injection moulding machines, Injection moulding process analysis, principles of compression and transfer molding, vacuum molding, Disc moulding, Moulds, Multi daylight moulds, Mould clamping devices, reaction injection moulding.

UNIT-III

Polymer Flow **10**

Extrusion processes: Mechanism of flow, Drag flow, Pressure flow, Leak flow, analysis of polymer extrusion process, Basic flow patterns in extrusion die-die exit instabilities, die swell, processing methods based on extruder, extrusion coating process.

UNIT-IV

Special Moulding **10**

Special moulding techniques: Calendering rolls arrangement and control, methods of sheet forming, matched mould forming, air blowing, vacuum forming techniques, thermo forming, techniques of blow moulding, rotation moulding, plastic finishing techniques.

Basic concepts in die design: Types of moulds, clamping force, ejection devices, mould cooling, screw standards, feeding devices, CAD / CAM applications.

References

1. R.J. Crawford Plastics Engineering , Pergamon Press, London, 1987
2. Richard G.Griskey, Polymer Process Engineering, Chapman and Hall, 1995
3. Peter Powell, A. Jan Ingen Houz, Engineering with Polymers, Stanley Thomas Publishers Ltd., 2nd Edn. 1992
4. George Mathews, Polymer Mixing Technology, Applied Science Publishers,1982
5. Friedhelm Hansen, Plastics Extrusion Technololgy, Hanser Publishers, Munich, 1988

MPT 104:Polymer Characterization

L T P: 3-0-0 **Credit: 3**

UNIT-I

Mechanical properties **4**

Mechanical properties of polymers: Tension, Shear, Compression, Flexural, Hardness, Impact, Abrasion, Creep, Stress relaxation.

UNIT-II

Characterization methods **12**

Electrical properties, Chemical properties, Flow properties, Magnetic properties, Optical properties, Nonlinear Optical properties and Acoustic Properties for characterization of polymers.

Microscopy – Optical, TEM, SEM, AFM techniques for characterization of polymers.

UNIT-III

Spectroscopic and X-ray diffraction methods **12**

Applications of FTIR, UV-Visible, mass spectrometry, Raman Spectroscopy, Nuclear Magnetic Resonance Spectroscopy, Electron spin resonance spectroscopy.

X-ray diffraction and characterization of polymer.

UNIT-IV

Thermal and chromatographic methods **12**

Thermal analysis: Principle, Instrument, and application – Differential Scanning Calorimetry (DSC), Differential thermal analysis(DTA), Thermogravimetric analysis (TGA), Dynamic mechanical thermal analysis (DMTA).

Chromatography: Principles and Applications of High Performance Liquid Chromatograpy and High Performance Thin Layer Chromatography.

References

1. G. Bodor, “Structural investigation of polymers”, ELLIS HORWOOD,1991.

2. Material Science of Polymers for Engineers, Tim A. Osswald and George , Menges, 1st edition, Hanser Pub., New York, 1995

MPT 105:Plastic Technology

L T P: 3-0-0 **Credit: 3**

UNIT – I

Introduction **10**

Plastics technology Raw materials: types of forms, products, applications consumption pattern, Tailoring of material, quantitative aspects of polymer processing additives and compounding – fillers, plasticizers, antioxidants, colorants, flame retardants, stabilizers compounding.

UNIT-II

Moulding **10**

Moulding – compression moulding, transfer moulding, injection moulding, RIM, bow moulding, rotational moulding, thermoset moulding, Extrusion – coextrusion, film extrusion, pultrusion, calendaring, casting, coating, foaming, forming laminates. Multipolymer systems and composites.

UNIT-III

Polymer in industry **10**

Polymers in electrical and electronics industry, electro conducting polymers, polymer batteries, electrets - polymers with piezoelectric, pyroelectric and ferroelectric properties-photo conducting polymers.

Polymers for high temperature resistance, fluoro polymers, aromatic polymers, heterocyclic polymers, polymers as building materials, ultrahigh fibres, aramids, technora, carbon fibres.

UNIT-IV

Polymer in lithography and Biomedical applications **10**

Polymers in lithography, photo resist, positive resists, negative resists, solution inhibition resists, image reversal process, Ion exchange resins, polymer membrane,polymer complexes for water treatment.

Polymer for biomedical applications, polymers in dentistry, tissue adhesives, dialysis membrane, blood oxygenators, bone cement, prostheses, biodegradable sutures, control drug delivery systems.

References

1. H.F. Mark (Ed), Encyclopedia of Polymer Science and Engineering, Wiley – Interscience, New York, 1991
2. L.L. Chapoy (Ed), Recent Advances in Liquid Crystalline Polymers, Chapman and Hall, London, 1985
3. R.W. Dyson, Speciality Polymers, Chapman and Hall, New York, 1987
4. C.P.Wong, Polymers for Electronic and Photonic Applications, Academic Press, New York, 1992

MPT 106: Polymer composites

L T P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **12**

Basic definitions, Various types of composites, Classification based on Matrix Material: Organic Matrix composites Polymer matrix composites (PMC), Carbon matrix Composites or Carbon-Carbon Composites, Metal matrix composites (MMC), Ceramic matrix composites (CMC), carbon nano tube- polymer composites, Classification based on reinforcements: Fiber Reinforced Composites, Fiber Reinforced Polymer (FRP) Composites, Laminar Composites, Particulate Composites, laminated composites, hybrid composites, Woven, knitted and braided materials, flexible composites. Advanced composites. Functions of a Matrix, Desired Properties of a Matrix,

UNIT-II

Polymer Matrix and reinforcement materials **8**

Polymer Matrix (Thermosets and Thermoplastics).

Role and Selection or reinforcement materials, Types of fibres, Glass fibers, Carbon fibers, Aramid fibers , Metal fibers, Alumina fibers, Boron Fibers, Silicon carbide fibers, Quartz and Silica fibers, Multiphase fibers, Whiskers, Flakes etc.

UNIT-III

Fibers **10**

Fibers-Glass –Types-E, S, C and D glasses. Rovings, yarns, CSM, surface mats, performs, woven and non woven fabrics-Production, Properties and applications. Carbon –Precursors-PAN and Pitch based; types –HT, HM and intermediate modulus, production, properties and applications. Aramid –Types-Kevlar, Technora HM-50-Production properties and applications. Natural fibers. Surface treatments. Woven, knitted and braided materials, three dimensional fabrics (woven and braided), fabric reinforced composites, flexible composites, Applications.

UNIT-IV

Resins and testing of composites **10**

Resins, Thermosets: Unsaturated polyester, epoxy, vinyl ester, silicone resins– production, properties and applications. Thermoplastics: Examples, Comparison with thermosets. Preparing techniques, properties and applications.

Testing of composites – fiber volume fraction, tensile, shear, compressive, flexural and thermoelastic responses of lamina and laminates, IOSEPESCU shear test, notched strength, fracture toughness, non destructive testing.

References

1. Mel. M. Schwartz, Composite Materials, Vol 1 & 2, Prentice - Hall PTR, New Jersey, 1997
2. Bor Z.Jang, Advanced Polymer composites, ASM International, USA, 1994
3. L.A. Carlsson and R.B. Pipes, Experimental Characterization of advanced composite materials, Second Edition, CRC Press, New Jersey, 1996
4. George Lubin, Stanley T. Peters , Handbook of Composites, Springer, 1998
5. Richard M. Christensen, Mechanics of composite materials, Dover Publications, 2005
6. A.A. Vaidya and S.S.Trivedi,Textile auxillaries and finishing chemicals, ATIRA, Ahemadabad, 1981
7. M.C.Gupta and A.P.Gupta, Polymer composites, New Age Publishers, 2005

MPT 107: Instrumentation in polymer industries

L T P: 3-0-0 **Credit: 3**

UNIT-I

Process variables, Measurement and control **12**

Process variables such as temperature, pressure, flow etc. and their measurements. Examples in polymer processing in moulding, extrusion.

Measurement and control, Simple systems, first and higher order systems, Design specifications on system time response, feedback control diagram, proportional, integral, derivative and PID controls.

UNIT-II

Mathematical analysis **10**

Mathematical analysis of processes and feed back control systems –poles, zeros and system stability, Stability Analysis, Routh's Test-Root locus,frequency response using Bode plot.

UNIT-III

Computer control and application **10**

Computer control and application – mathematical concepts of discrete variables analysis and multivariable processes and other control methods as feed forward control, ratio control and internal model control etc.

UNIT-IV

Instrumentation in moulding **8**

Instrumentation in blow moulding, extrusion and injection moulding and control systems.

References

1. D.M.Considine, Process Instruments and Controls Hand Book, McGraw Hill Book
2. Co.,1964
3. D.R.Coughanour, Process Systems Analysis and Control, McGraw Hill Book
4. Co.,1991
5. H.R.Simonds, Encyclopedia of Plastic Equipment, Reinhold Publishing Co., 1964.
6. D.V.Rosato, Blow Moulding Hand book, Hanser Publications, 1989.
7. Allan L. Griff, Plastic Extrusion Technology, Reinhold Plastics Applications Series, 1962.
8. A.Whelan, Developments in Injection Moulding, Applied Science Publications,1989.
9. Sidney Levy, Plastic Extrusion Technology Hand Book, Industrial Press Inc.,NewYork,1989.

MPT 108:Engineering Plastics

L T P: 3-0-0 **Credit: 3**

UNIT-I

Polyamides **10**

Polyamides -aliphatic polyamides-nylon 6, nylon 11,nylon 7,nylons 46,66,69,610,612-structure and properties of aliphatic polyamides, additives, processing, application, commercial grades, modified nylons Polyimides,modified polyimides, polyamide-imides, polyetherimides, elastomeric polyimides.

UNIT-II

Polyacetals and other polymers **10**

Polyacetals- Synthesis of acetal resins, structure and properties, processing, additives-acetal-alloys, application of homo and copolymers, elastomeric acetals,

Polysulfones, polyphenylene sulfides–PPS, PPSO -structure and properties, processing, application and blends with other polymers.

Poly phenylene oxides, polyetherketones- PPO,PEK,PEEK- structure and properties, processing, application and copolymers, blends.

UNIT-III

Polyesters and inorganic polymers **12**

Polyesters-Unsaturated Polyesters-curing system, production, commercial grades, structure and properties, water extended polyesters, fibre and film forming polyesters PET, PBT and copolyesters-liquid crystalline polyesters-application.

Polymers for high temperature resistance-Fluorine containing polymers, inorganic polymers, poly p-phenylene, ladder and spiro polymers, coordination polymers.

UNIT-IV

Polycarbonates **8**

Polycarbonates-synthesis through ester exchange-structure and property relation, commercial grades-processing characteristics-application of polycarbonate alloys and homo-polymers-commercial copolymers.

References

1. Plastics Materials: Brydson J.A., ih Edn., Butter worth,
2. The Role of Additives in Plastics, Mascia,L, : Edward Arnold, 1974.
3. Functional Monomers and polymers Kiichi Jakenioto, Raphael M, Ottenbrites, Mikhiaru kamachi : Marcel Dekker.
4. Engineering Polymers: Dyson R.W., Blackie, 1990.
   Selecting Thermoplastics for Engineering Applications., MacDermott,C.P., and Shenoy A.V., Marcel Dekker, 1997.

ELECTIVES

MPT 011:Rubber Technology

L T P: 3-0-0 **Credit: 3**

UNIT -I

Introduction **10**

History of synthetic rubber, Criteria for a polymer to behave as a rubber – structure vs Tg, chemical, mechanical and electrical properties, polymerisation types and techniques involved in production of general purpose rubbers, ozone attack on rubbers, protection against oxidation, antioxidants, network bound antioxidants.

UNIT-II

Vulcanization **10**

Vulcanization – chemistry of vulcanization, sulfur vulcanization, physical aspects of vulcanization. Reinforcement, types of fillers, carbon black.

Heat resistant rubbers, polyisobutylene, butyl and EPDM rubbers, solvent/oil resistant rubbers,nitrile, neoprene and chloroprene rubbers.

UNIT-II

Rubber processing **8**

Rubber processing – mixing operations, composition, concentration, stabilisation, coagulation, open mill mixing, internal and continuous mixers, forming operations, calendaring, extrusion, spreading and moulding operations.

UNIT-IV

Rubber products **12**

Rubber product manufacture, tyres – functions, requirements, basic design reinforcing systems, construction, manufacture, testing, tube manufacture, compounding for tyre and tube.

Belting and hoses, conveyor, transmission (V and flat) belting, troughing moulded, braided and hand, built hoses, compounding, footwear and ports goods, hot air vulcanized, compression moulded, direct moulded process for shoe bottoming, injection moulded sole and heel UNITs, safety and antistatic foot wear, micro and macrocellular rubbers, expanding rubber by nitrogen gassing and chemical blowing agents, tennicoit rings.

References

1. M.Morton, Rubber Technology, Van Nostrand Reinhold, 1987
2. Whelan and K.S.Lee, Developments in Rubber Technology, Vol. 1 – 4, Applied Science Publishers, London 1981

MPT 012: Degradation of Polymers

L T P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **4**

Definition, Types of polymer degradation - Chain depolymerization, Random scission, Degradation by Substituent Reaction; Kinetics and Mechanism of different types of degradation-

UNIT-II

Degradation **16**

Thermal degradation, thermal degradations of polyvinyl chloride, polyvinyl acetate, acrylicpolymer, poly(acrylo)nitrile, and Polysiloxanes ; Mechanical degradation, Degradation by Ultrasonic waves, Photo degradation, Photostabilizers, Detection of degradation products during photodegradation, Degradation by high energy radiation, Oxidative degradation, Degradation by Ozone oxidation, Photo-oxidative degradation, General mechanism of polymer Photo-oxidation , Photo-oxidation of low-density polyethylene [LDPE], Effects of dyes/pigments on degradation, Protection against photo-oxidation, Hydrolytic degradation, Antioxidants.

UNIT-III

Biodegrability of polymers **10**

Biodegrability of polymers, naturally occurring biopolymers, Synthestic biodegradable polymers- polyglycolate, polymandelic acid. Copolymer of 1,4- butanediol with adipic acid and sebacic acid, polyalkylene tartrate cellulose block copolymers -biodegradable polyamides –copolymers of α- amino acid (glycine, serine), $\in$ - aminocaproic acid.

UNIT-IV

Principle of Biodegradation **10**

Principles of Biodegradation: introduction, modes of biological degradation, enzymatic degradation of biopolymers (poly saccharides, proteins, nucleic acids) and synthetic polymers, microbial degradation of synthetic polymers.

References

1. J.Guillet, Ed., Polymers and Ecological problems, Plenum Press New York, 1973
2. W.Schnabel Polymer Degradation – Principles and Practical Applications, Hanser International, 1981
3. L.L.Hench, E.C. Ethridge Ed., Biomaterials – An Interfacial Approach, Biophysics and Biotechnology Series, Vol 4, Academic Press New York, 1982
4. Jens Nielsen and John Villadsen, Bio-reaction Engineering Principles, Plenum Press. New York, 1994
5. R Smith, Biodegradable polymers for industrial application, Queen Mary University, London, UK, Wood Head Publishing Ltd

MPT 013:Speciality polymers

L T P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **10**

Introduction to conducting polymers, Correlation of chemical structure and electrical conductivity, Conditions for conductivity, Synthesis of conducting polymers – chemical, electrochemical and enzymatic methods, doping, general considerations, measurement of conductivity, factors affecting conductivity.

UNIT-II

Processibility, characterization and applications **10**

Processability and applications of acetylene, aniline, pyrrole, thiophene and para, phenylene based conducting polymers.

Characterization of conducting polymers, electroanalytical techniques – cyclic voltammetry, chronoamperometry and chronocoulometry, spectral methods, use of UV-vis ,Raman, XRD and NMR Spectroscopy.

Applications of conducting polymers in industries

UNIT-III

Special polymers **12**

Photoconductive Polymers , Light Emitting Polymers - Characteristic features of Light emitting Polymers, Chemistry of LEPs, Preparation of LEP devices, Applications, Liquid crystalline polymers, Polymer Gels, Magnetic Polymers, Ferroelectric polymers, Piezoelectric Polymers-Polyvinyl difluoride, Pyroelectric Polymers,

UNIT-IV

Shape memory polymers **8**

Shape memory polymer, Thermodynamics of the shape memory effect, Ionic Polymer Metal Composite (IPMC), Polymer Composites in Construction, Nonlinear optical polymers

References

1. T.A. Skotheim, R.L. Elsenbaumer and J.R. Reynolds, Hand book of Conducting Polymers – 2nd Edn, Revised and enlarged, Marcel Dekker
2. Inc., New York, 1998
3. J.M. Margolis (Ed.), Conducting Polymers and Plastics, Chapman and Hall, London, 1989
4. R.B. Seymour, ed., Conductive Polymers", Plenum Press, New York, 1981
5. Z.Tadmore Principles of Polymer Processing, Wiley – Interscience, New York, 1979
6. B. Wessling, Electronic Properties of Conjugated Polymers, Vol.3, Springer, Berlin, 1989
7. H.G. Kiess (Ed.), Conjugated Conducting Polymers, Springer, Berlin, 1992
8. R.W.Dyson(Ed), Speciality Polymer, Blacki, Academic Professional, Chapmann,UK, 1998.

OPEN ELECTIVES

OEM 003: Plastic waste management

L T P: 3-0-0 **Credit: 3**

UNIT I

Polymer wastes **8**

Polymer wastes**:** Sources of plastic waste – definitions, generation of industrial plastic waste, plastic in solid waste; Separation of components in municipal refuse - separation process specific to plastics.

UNIT-II

Primary and secondary recycling **8**

Primary and secondary recycling: Primary recycling, degradation of plastics, industrial practice, Secondary recycling, approaches to secondary recycling, mechanical reworking of plastic waste, chemical modification of mixed plastic waste, coextrusion and coinjection moulding, waste plastics as fillers.

UNIT-III

Tertiary and Quaternary recycling **8**

Tertiary and Quaternary recycling**:** Tertiary recycling, chemicals from plastics waste, pyrolysis chemical decomposition of plastic waste; Quaternary recycling energy from plastics waste, incinerator, energy recovery from municipal refuse, effect of plastics on the incineration process, plastics as land refill.

UNIT IV

Recycling of plastics **16**

Recycling of plastics: Recycling of plastics, surface refurbishing; Plastic aging, environmental aging, thermal aging, weathering, chemical degradation, ionising radiation, wear and erosion, Biodegradation, biodegradable plastics, photodegradable plastics.

Recycling processes: Specific recycling processes, PET reprocessing, polyolefines, polystyrene, PVC, acrylics, Thermosets, PURS, phenolics, polyesters, epoxy resins, melamine and urea resins, recycling technologies.

References

1. Nabil Mustafa, Plastics Waste Management: Disposal, Recyling and Reuse, Marcel Dekker Inc., New York, 1993
2. R. J. Ehrig, Plastic recycling: Products and Processes, Hanser Publishers, New York, 1992
3. Jacob Leidner, Plastic waste: Recovery of Economic Value, Marcel Dekker Inc., New York, 1982
4. John Scheirs, Plastic Recycling, John Wiley and Sons, New York, 1998
5. Ann Christine, Albertsson and Samuel J. Huang, Degradable Polymers: Recycling of Plastics, Marcel Dekker Inc., New York, 1995
6. A.K. Bhowmick and H.L.Stephens, Hand Book of Elastomers, Marcel Dekker, New York, 1988
7. J. A. Brydson, Rubbery Material and their Compound', Kluwer Academic Publishers Group, 2001
8. M. Blow and C.Hepburn, "Rubber Technology and Manufacture", 2rd Edn.,Butterworths, London, 1982
9. Whelan, Injection Moulding Machine, Elsevier Publications, London, 1989

OEM 004:.Polymer Blends and Alloys

L T P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **8**

Definition & classification of polymer blends & alloys. Physical, Mechanical & thermal properties and testing of polymer blends.

UNIT-II

Polymer mixing **12**

Thermodynamic theory - thermodynamics of polymer mixing, Rheology of blends.

Experimental determination of miscibility of blends- turbidity, light scattering, SAXS, WAXD, SANS, Fluorescence, ultrasound etc.

UNIT-III

Structure properties relationship and blend morphology **10**

Structure properties relationship of multi phase system. Compatibilisation - Reactive & physical compatibilisation.

Blends morphology & characterization-Optical microscope, SEM, TEM, AFM.

UNIT-IV

Techniques of blending and Engineering polymers **10**

Techniques of blending, Commercial blends & applications.

Toughened polymers, Liquid Crystalline Polymers, Interpenetrating polymers, High performance Engineering polymer blends.

References

1. Paul D.A., and Newman S., "Polymer Blends", Academic press.
2. Dyson, R.W., "Engineering Polymers", Chapman and Hall, 1990.
3. Polymer Blends and Alloys, ed by G. O. Shonaike and G. P. Simon, Marcel Dekker, 1999.
4. Commercial Polymer Blends, Leszek. A. Utracki, Chapman and Hall, 1998.
5. Polymer Blends and Alloys, Leszek. A. Utracki, Henser Publishers, 1989

OEM 005: Polymeric Biomaterial

L T P: 3-0-0 **Credit: 3**

UNIT-I

Introduction **8**

Biomaterials-Definition classification, Applications. Biological material and Biomaterials. Implant and transplant. Advantages and disadvantages of various biomaterials. Comparison with natural tissue replacement materials.

UNIT-II

Polymers and biocompatibility **12**

Structure-property relationship of polymeric (Natural-protein, polysaccharides etc and synthetic-polyolefins, Acrylics, celluloses epoxy, Fluoro polymers, Vinyl polymers, polyurethanes, silicones, hydrogels etc.), and non-polymeric (Metals, ceramics, and composites) Biomaterials. Structure property relationship of mineralized and non mineralized tissues (bone, teeth, skin, ligament, tendon, cartilage etc.)

Bio compatibility and blood compatibility, Bio-ethics. Invitro and invivo test for biocompatibility and blood compatibility.

UNIT –III

Bioactive polymers **10**

Bioactive, Bioresorbable, Biodegradable, Superabsorbent, Biostable and porous tissue ingrowth implant materials. Sterilization of implants. Deterioration of polymer properties.

Soft tissue replacement - Extra corporeal, intracorporeal devices, sutures, surgical tapes, adhesives, percutanious devices, heart assist device, artificial skin, maxillofacial organs, kidney, eye.

UNIT-IV

Applications of Biopolymers **10**

Hard tissue replacement - various joints, fracture fixation devices, dental implants. Bone implant fixation problems and steps to mitigate them.

Drug delivery system, Polymeric medication, Disposable in Health care, Packaging.

References

1. Polymeric Biomaterial. S. Dumitriu, Marcel Dekker Inc., New York, 1993.
2. Biomaterial science, B. Ratner, Elsvier Academic Press, New York, 2004.

M.Tech.

Syllabus
for
Technical Communication

COURSE STRUCTURE & SYLLABUS

(with effect from academic session 2012-13)

Department of Humanities
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Humanities
School:	School of Engineering and Technology
Name of the Course:	M. Tech. (Technical Presentation)
Duration:	Two years
Total number of Credits:	66 (in all subjects) For Technical Presentation -02 credits.
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. Rakesh Kumar, HOD — Chairman 2. Prof. Lallan Prasad, Delhi Univ. — Ext. Member 3. Dr. Brinda Chowdhari — Int. Member 4. Dr. Naheed Saba — Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by Combined BOS held on July 12, 2012 and Faculty Board meeting held on July 18, 2012

COURSE STRUCTURE

M. Tech. in Electrical and Electronics Engineering with specialization in Instrumentation & Control

SEMESTER	Courses (L-T-P) Credits							L. Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Analog & Digital Signal Processing (3-0-0) 3	Smart Sensors & Sensor Networking (3-0-0) 3	Advanced Control Systems (3-1-0) 4	Departmental Elective-1 (3-0-0) 3	Optimization Techniques in Engineering (3-1-0)4	Signal Processing Lab (0-0-4)2	Foreign Language (1-0-2) 2	**6**	**16**	**2**	**6**	**24**	**21**
II	Telemetry and SCADA (3-0-0) 3	DCS & PLC (3-0-0)3	Departmental Elective-2 (3-0-0) 3	Departmental Elective-3 (3-0-0) 3	Open Elective (3-0-0) 3	Process I & C Lab (0-0-4)2	Technical Presentation (1-0-2)2	**6**	**16**	**0**	**6**	**22**	**19**
III	Seminar (0-0-2)2	Project (0-0-4) 4	Dissertation (0-0-15) 8					**0**	**0**	**0**	**21**	**21**	**14**
IV	Dissertation (0-0-21) 12							**0**	**0**	**0**	**21**	**21**	**12**

Total Credits- 66

LIST OF DEPARTMENTAL ELECTIVES

NIL

LIST OF OPEN ELECTIVES

NIL

M.Tech

Syllabus for

Technical Presentation

PCM-109: Technical Presentation

LTP: (1-0-2) **Credits: 02**

UNIT 1: Technical Presentation **(07)**

- Presentation: Approaches and Methods
- Creating PowerPoint Presentations
- General guidelines for Technical Presentation
- Technical presentations: Practical
- Presenting data using graphics
  (with Presentation/Model Slides)

UNIT 2: Technical Documentation **(08)**

- Writing Proposals, Reports, Letters, emails.
- Writing Synopsis
- Writing Dissertation
- Research techniques using the library and the Internet
- How to write Bibliographies
- Technical paper writing
  (workshops)

UNIT 3: Oral Presentation Skills **(07)**

- Public speaking.
- Oral presentation of reports
- Defending the research Topic
  (Individual and Group Presentations)

References:

1. *Presentation skills by* Steve Mandel (fourth Edition)
2. *Technical communication* by Minakshi Raman, OUP
3. *Technical Communication* by M. Ashraf Rizvi
4. Pearsall, Thomas E.; Cook, Kelli Cargile, *Elements of Technical Writing.Longman, 2009.*

Annexure-XXIV-B of Agenda Item no. 6.23

Course Structures and Syllabi

for

M. Tech.

in

Mechanical Engineering

TABLE OF CONTENTS

M.Tech.

in

Mechanical Engineering

with specialization in

Machine Design

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Mechanical and Automobile Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Mechanical and Automobile Engineering
School:	School of Engineering and Technology
Name of the Course:	M.Tech. in Mechanical Engineering with Specialization in Machine Design
Duration:	Two (02) years
Total number of Credits:	66
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. G. P. Sinha, HOD, ME&AE, Chairman 2. Prof. D.V. Singh, Fmr. Dir., IIT-R, Ext. Member 3. Prof. S. Prasad, Advisor, GLA Bajaj, Special Invitee 4. Prof. P.K. Sinha, Prof. Emer., ME&AE, Int. Member 5. Prof. R.C. Sachdeva, Dist. ME&AE, Int. Member 6. Prof. Y.V. Satya Kumar, ME&AE, Int. Member 7. Prof. Subhash Kamal, ME&AE, Int. Member 8. Dr. A. Singh, Assoc. Prof., ME&AE, Int. Member 9. Mr. Manish Kr. Yadav, Asst. Prof., Int. Member 10. Mr. Umesh Kr. Jha, Asst. Prof, Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by the BOS and Faculty Board

COURSE STRUCTURE
M. Tech. in Mechanical Engineering with Specialization in Machine Design

SEMESTER	Courses (L-T-P) Credits							L. Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Finite Element Methods (3-1-0) 4	Heat and Mass Transfer (3-1-0) 4	Instrumentation & Control (3-0-0) 3	Advanced Materials Engineering (3-0-0) 3	Theory of Elasticity and Plasticity (3-0-0) 3	Foreign Language (1-0-2) 2	CAD Lab (0-0-4) 2	**6**	**16**	**2**	**6**	**24**	**21**
II	Advanced Machine Design (3-0-0) 3	Open Elective (3-0-0) 3	Fracture Mechanics (3-0-0) 3	Departmental Elective-1 (3-0-0) 3	Departmental Elective-2 (3-0-0) 3	Technical Presentation (1-0-2) 2	Thermal -Lab (0-0-4) 2	**6**	**16**	**0**	**6**	**22**	**19**
III	Technical Seminar (0-0-2) 2	Project (0-0-4) 4	Dissertation-I (0-0-15) 8					**0**	**0**	**0**	**21**	**21**	**14**
IV	Disserta-tion (0-0-21) 12							**0**	**0**	**0**	**21**	**21**	**12**

Total Credits – 66

Core Subjects

1. Finite Element Methods

2. Heat and Mass Transfer
3. Instrumentation & Control
4. Advanced Materials Engineering

Specialization (Machine Design) Core Subjects

1. Theory of Elasticity and Plasticity
2. Advanced Machine Design
3. Fracture Mechanics

Departmental Electives (Any Two)

1. Theory of Plates and Shells
2. Advanced Mechanical Vibration
3. Advanced Composite Materials
4. Computer Applications in Design
5. Advanced Optimization Techniques
6. Dynamics of Mechanical Systems

Open Electives

1. Tribology
2. Renewable Energy and Energy Management
3. Reliability Engineering

M.Tech.

in

Mechanical Engineering

with specialization in

Machine Design

SYLLABI

MME101: FINITE ELEMENT METHODS

LTP: 3-1-0 **Credits: 4**

UNIT 1: Approximate Solution Methods (8)

Ritz and Rayleigh Ritz methods, Method of weighed residuals, General concepts, Point collocation, Subdomain collocation, Least squares, Galerkin method.

UNIT 2: Finite Difference Method (8)

Characteristics and classification of PDE, Solution of elliptic, Hyperbolic & parabolic PDE using Finite Difference Method.

UNIT 3: Introduction to Finite Element Method (12)

Introduction to variational calculus, The differential of a function; Euler-Lagrange equation, Geometric & natural boundary conditions, Basic Concept of Finite Element Method, Principle of potential energy; 1D elements, Derivation of Stiffness and Mass matrices for a bar, A beam and A shaft, Comparison with Analytical results; Interpolation and Shape functions; Solution of static problems and case studies in stress analysis of Mechanical components; FEA using 2D and 3D elements; Plain strain and plain stress problems, FE using plates / shell elements.

UNIT 4: Isoparametric Elements and Analysis (4)

Isoparametric Elements.

UNIT 5: Importance of Finite Element Mesh (8)

Automatic meshing techniques; Case studies using FEM for Design of simple element geometries such as a tapered bar, A plate with a hole.

Laboratory Work:

Practice of the concept covered in Lecture. Use of software for Finite Element Analysis.

Reference Books:

1. Reddy, J. N., An Introduction to the Finite Element Method, McGraw Hill, 2001.
2. Bathe, K. J., Finite Element Procedures, PHI, 1996.
3. Chandrupatla, T. R. and Belgundu, A. D., Introduction to Finite Elements in Engineering, PHI, 1997.
4. Zienkiewicz, O. C., The Finite Element Method, McGraw Hill, 2002.
5. Huebner, K. H., Dewhirst, D. L., Smith, D. E. and Byrom, T. G., The Finite Element Methods for Engineers, John Wiley and Sons, 2000.
6. Buchman, G. R., Finite Element Analysis, Schaum's Outlines, McGraw Hill, 1995.
7. Jordan, C. Calculus of Finite Differences, American Mathematical Society, 1979.

MME102:HEAT AND MASS TRANSFER

LTP: 3-1-0 **Credits: 4**

UNIT 1: Conduction **(10)**

Review of the basic laws of conduction, convection and radiation. General heat conduction equation in different co-ordinates. One dimensional steady state conduction with variable. Thermal conductivity and with internal distributed heat sources, extended surfaces review, Tapered fins, design considerations. Two dimensional steady-state conduction, semi-infinite and finite flat plates and cylinders, graphical method, relaxation technique. Unsteady state conduction in solids with infinite thermal conductivity, infinite thick-solids, periodic variation, solutions using Grolber's and Heisfer's charts.

UNIT 2: Convection **(8)**

Hydrodynamic and thermal boundary layers, differential equations, momentum and energy and their solutions, heat transfer in turbulent flow, eddy heat diffusivity, Reynold's analogy between skin friction and heat transfer. Free convection, empirical correlations, regimes of boiling, Nucleate and film boiling.

UNIT 3: Heat Exchangers **(4)**

Introductions, effectiveness and number of transfer units, design of heat exchangers.

UNIT 4: Radiation **(8)**

Introduction, laws of radiation, heat exchange between black bodies and non-black bodies, shape factor algebra, Radiation shields, electrical net-work approach of radiation heat exchange.

UNIT 5: Mass Transfer **(6)**

Introduction, Fick's law, General equation of mass diffusion steady state, diffusion through a plain membrane, diffusion of water vapour through air, Mass transfer coefficient, convective mass transfer, boundary layer governing equations, momentum heat & mass transfer analogies, mass transfer correlations.

UNIT 6: Heat Pipe **(4)**

Introduction, Working of Heat pipe, Different types of Heat Pipe, Detail of Heat Pipe components, Advantages of Heat Pipe, Application of Heat Pipe, Performance of Heat Pipe, Limitation of Heat Pipe, Analysis and Design of Heat Pipe.

Reference Books:

1. Fundamentals of Engineering Heat & Mass Transfer by R. C. Sachdeva, New Age Publishers.
2. Heat Transfer by Holman.
3. Principles of Heat Transfer by Kreith, McGraw Hill.
4. Transport phenomena by Bird, John Wiley.

MME103: INSTRUMENTATION & CONTROL

LTP: 3-0-0 **Credits: 3**

UNIT 1: Measurements and Measurement Systems (6)

Introduction, significance of measurement, methods of measurement, primary secondary and tertiary measurements, mechanical electrical and electronics instruments, applications of measurement system, elements of a generalized measurement system and its functional elements, classifications of standards, primary, secondary and working standards.

UNIT 2: Instrumentation Characteristics (4)

Static and dynamic characteristics, first and second order systems response, classification & sources of error, loading facts, mechanical, electrical

UNIT 3: Analysis of Experimental Data (6)

Errors and uncertainties in experiments, role of statistics and variance types of data, presentation of the observations, criteria for rejecting data, specifying result of experiments, confidence level, uncertainty analysis, overall uncertainty, graphical analysis and curve fitting, theory of least squares, application in calibration, goodness of fit, significant figures and rounding off.

UNIT 4: Transducers (8)

General criteria for selection, strain gauge, rosettes; types, applications. Variable inductance transducers, capacitive, piezo-electric transducers, transducers. Advantages and limitations of digital transducers over analog transducers, digital encoding transducers, classification of encoders, construction of encoders, shaft encoder, optical encoder.

UNIT 5: Control Systems (6)

Introduction, types of control systems, performance analysis, mathematical modeling, block diagram representation, representation of systems or processes, comparison elements, transfer function, representation of temperature control systems, signal flow graphs.

UNIT 6: Types of Controllers (4)

Introduction, types of control action, hydraulic controllers, electronic controllers, controllers.

UNIT 7: Transient and Steady State Response (6)

Time domain representation, laplace transform representation, system with proportional control, proportional cum derivative control, proportional cum integral control, error constants.

Reference Books:

1. Instrumentation for Measurement in Engineering by S. Gupta
2. Theory and application of Automatic Controls by B.C. Nakra.
3. A course in Mechanical Measurement & Instrumentation by A.K. Sawhney, D.R Publisher.
4. Mechanical Measurement by Beckwith & Buck

MME104:ADVANCED MATERIALS ENGINEERING

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(8)**

Retrospective of materials science in Engineering; Classification and importance of materials; Traditional engineering materials, Modern engineering materials, Advanced materials, Biomaterials, Nano-materials, Future materials.

UNIT 2: Polymers **(10)**

Definitions and types of polymers, Synthesis, processing and fabrication of polymers, Behavior of polymers: Crystallization, melting, glass transition, anelasticity, mechanisms of deformation and strengthening; Applications in structural, electrical and functional domains.

UNIT 3: Ceramics **(8)**

Definitions and types of ceramics, Traditional and Advanced Ceramics, Synthesis, Processing and fabrication of ceramics. Fracture mechanics of structural ceramics, Applications in structural, electrical and functional domains.

UNIT 4: Composites **(10)**

Refresher of Miller indices for cubic and non-cubic systems, anisotropic elasticity; Definition of composites, Elastic behavior of composites; Types of matrices, reinforcement and interfaces; Types of composites: PMCs, MMCs, CMCs, IMCs, SMCs and Nano-composites; Applications in natural, biological, structural and functional systems.

UNIT 5: Case Studies **(4)**

Case studies of development of space materials, superconducting materials, biomaterials, nano materials and future materials.

Reference Books:

1. Callister's Materials Science and Engineering: Indian Adaptation (W/Cd), by R.Balasubramaniam, Wiley India.
2. Introduction to Polymers, Robert J. Young, Peter A. Lovell, CRC Press.
3. Introduction to Ceramics, W. David Kingery, H. K. Bowen, Donald R. Uhlmann, John Wiley & Sons.
4. Composite Materials: Science and Engineering, Krishan Kumar Chawla, Springer.
5. Biomaterials Science: An Introduction to Materials in Medicine, Buddy D. Ratner, Academic Press
6. Indicated Research Publication and Class Notes.

MME105: THEORY OF ELASTICITY AND PLASTICITY

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(6)**

Definition and Notation for forces and stresses. Components of stresses, equations of Equilibrium, Specification of stress at a point. Principal stresses and Mohr's diagram in three dimensions. Boundary conditions .Stress components on an arbitrary plane, Stress invariants, Octahedral strain, Strain rate and the strain rate tensor. Decomposition of state of stress, Stress transformation**.**

UNIT 2: Introduction to Strain **(6)**

Deformation**,** Strain Displacement relations, Strain components, The state of strain at a point, Principal strain, Strain transformation, Compatibility equations, Cubical dilatation , Engineering and natural strains, Mathematical relationships between true stress and true strains

UNIT 3: Stress -Strain Relations and the General Equations of Elasticity **(6)**

Generalized Hooke's law in terms of engineering constants. Formulation of elasticity Problems, Existence and uniqueness of solution, Saint -Venant's principle, Principle of super position

UNIT 4: Two Dimensional Problems in Cartesian Co-Ordinates **(6)**

Airy's stress function, investigation for simple beam problems. Bending of a narrow cantilever beam under end load, simply supported beam with uniform load, Use of Fourier series to solve two dimensional problems

UNIT 5: Yield Criteria for Ductile Metal **(6)**

Von Mises, Tresca, Yield surface for an Isotropic Plastic materials, Stress space, Experimental verification of Yield criteria, Yield criteria for an anisotropic material

UNIT 6: Thermal Stresses **(2)**

Introduction, Thermo-elastic stress -strain relations, Thin circular disc, Long circular cylinder.

UNIT 7: Torsion of Prismatic Bars **(3)**

Torsion of Circular and elliptical cross section bars, Soap film analogy, Membrane analogy, Torsion of thin walled open and closed tubes.

UNIT 8: Elastic Stability **(2)**

Axial compression of prismatic bars, Elastic stability, Buckling load for column with constant cross section.

UNIT 9: Slip Line Theory **(3)**

Introduction, Basic equations for incompressible two dimensional flow, continuity equations, Stresses in conditions of plain strain convention for slip-lines, Geometry of slip lines, Properties of slip lines

Reference Books:

1. Timoshenko and Goodier, "Theory of Elasticity,"McGraw Hill.
2. Dym C. L and Shames. I. H, “Solid Mechanics,” McGraw Hill, 1973
3. R.A.C. Slater, Engineering Plasticity - Theory and Application to Metal Forming Process, McMillan.
4. Sadhu Singh, Theory of Plasticity and Metal forming Process, Khanna Publishers, Delhi.
5. T.G.Sitharam, " Applied Elasticity," Interline publishing.

6. L S Srinath" Advanced Mechanics of Solids," Tata McGraw Hill Company.
7. Sadhu Singh," Theory of Elasticity," Khanna publisher
8. Phillips, Durelli and Tsao, "Analysis of Stress and Strain," McGraw Hill Book.
9. Wang. C. T., “Applied Elasticity”
10. Plasticity for Mechanical Engineers - Johnson and Mellor
11. Haffman and Sachs Theory of Plasticity.
12. Chakraborty , Theory of plasticity, McGraw Hill

MME106: ADVANCED MACHINE DESIGN

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(4)**
Role of failure prevention analysis in mechanical design ,Modes of mechanical failure, Review of failure theories for ductile and brittle materials including Mohr's theory and modified Mohr's theory, Numerical examples.

UNIT 2: Fatigue of Materials **(6)**
Introductory concepts, High cycle and low cycle fatigue, Fatigue design models ,Fatigue design methods ,Fatigue design criteria, Fatigue testing, Test methods and standard test specimens, Fatigue fracture surfaces and macroscopic features, Fatigue mechanisms and microscopic features.

UNIT 3: Stess-Life (S-N) Approach **(6)**
S-**N** curves, Statistical nature of fatigue test data, General S-N behavior, Mean stress effects, Different factors influencing S-N behaviour, S-N curve representation and approximations, Constant life diagrams, Fatigue life estimation using S-N approach.

UNIT 4: Strain-Life(S-N) Approach **(6)**
Monotonic stress-strain behavior ,Strain controlled test methods ,Cyclic stress-strain behavior ,Strain based approach to life estimation, Determination of strain life fatigue properties, Mean stress effects, Effect of surface finish, Life estimation by ε-N approach.

UNIT 5: LEFM Approach **(4)**
LEFM concepts, Crack tip plastic zone, Fracture toughness, Fatigue crack growth, Mean stress effects, Crack growth life estimation.

UNIT 6: Statistical Aspects of Fatigue **(4)**
Definitions and quantification of data scatter, Probability distributions, Tolerance limits, Regression analysis of fatigue data, Reliability analysis, Problems using the Weibull distribution.

UNIT 7: Fatigue from Variable Amplitude Loading **(6)**
Spectrum loads and cumulative damage, Damage quantification and the concepts of damage fraction and accumulation, Cumulative damage theories, Load interaction and sequence effects, Cycle counting methods, Life estimation using stress life approach.

UNIT 8: Surface Failure **(4)**
Introduction, Surface geometry, Mating surface, Friction, Adhesive wear, Abrasive wear, Corrosion wear, Surface fatigue spherical contact, Cylindrical contact, General contact, Dynamic contact stresses, Surface fatigue strength.

Reference Books:

1. Metal Fatigue in Engineering, Ralph I. Stephens, Ali Fatemi, Robert .R. Stephens, Henry o. Fuchs, John Wiley, Second edition, 2001.
2. Failure of Materials in Mechanical Design, Jack. A. Collins, John Wiley, 1992.
3. Machine Design, Robert L. Norton, Pearson.
4. Fatigue of Materials, S. Suresh, Cambridge University Press, Cambridge, U.K.
5. Fundamentals of Metal Fatigue Analysis, Julie. A. Benantine, Prentice Hall, 1990
6. Fatigue and Fracture, ASM Hand Book, Vol. 19, 2002.

MME107: FRACTURE MECHANICS

LTP: 3-0-0 **Credits: 3**

UNIT 1: Principles **(6)**

Introduction and historical review, Sources of micro and macro cracks. Stress concentration due to elliptical hole, Strength ideal materials, Griffith's energy balance approach. Fracture mechanics approach to design. NDT and Various NDT methods used in fracture mechanics, Numerical problems.

UNIT 2: **(4)**

The Airy stress function. Complex stress function. Solution to crack problems. Effect of finite size. Special cases, Elliptical cracks, Numerical problems.

UNIT 3: **(4)**

Plasticity effects, Irwin plastic zone correction. Dugdale approach. The shape of the plastic zone for plane stress and plane strain cases, Plastic constraint factor. The Thickness effect, numerical problems.

UNIT 4: Determination of SIF and Plane Strain Fracture Toughness **(6)**

Introduction, analysis and numerical methods, experimental methods, estimation of stress intensity factors. Plane strain fracture toughness test, The Standard test. Size requirements. Non-linearity. Applicability.

UNIT 5: **(4)**

The energy release rate, Criteria for crack growth. The crack resistance(R curve). Compliance, J integral. Tearing modulus. Stability.

UNIT 6: Elastic Plastic Fracture Mechanics **(6)**

Fracture beyond general yield. The Crack-tip opening displacement. The Use of CTOD criteria. Experimental determination of CTOD. Parameters affecting the critical CTOD.Use of J integral. Limitation of J integral.

UNIT 7: Dynamics and Crack Arrest **(4)**

Crack speed and kinetic energy. Dynamic stress intensity and elastic energy release rate. Crack branching. Principles of crack arrest. Crack arrest in practice. Dynamic fracture toughness.

UNIT 8: Fatigue Crack Propagation and Applications of Fracture Mechanics: **(6)**

Crack growth and the stress intensity factor. Factors affecting crack propagation. variable amplitude service loading, Means to provide fail-safety, Required information for fracture mechanics approach, Mixed mode (combined) loading and design criteria.

Reference Books:

1. Elementary Engineering Fracture Mechanics, David Brock, Noordhoff.
2. Fracture Mechanics-Fundamental and Application, Anderson, T.L, CRC press,1998.
3. Engineering fracture mechanics, S.A. Meguid, Elsevier.
4. Fracture of Engineering Brittle Materials, Applied Science, Jayatilake, London.
5. Fracture and Fatigue Control in Structures, Rolfe and Barsom, Prentice Hall.
6. Introduction to fracture mechanics, Karen Hellan, McGraw Hill.
7. Fundamentals of Fracture mechanisms, Knott, Butterworths.
8. Fracture, Volume II, Liefbowitz.

MME001:THEORY OF PLATES AND SHELLS

LTP: 3-0-0 **Credits: 3**

UNIT 1: **(6)**
Bending of long rectangular plate into a cylindrical surface, Differential equation - Bending of plate with different boundary conditions, Long plate on elastic foundation

UNIT 2: Pure Bending **(2)**
Moment and curvature relations problems of simply supported plates, Strain energy of impure bending.

UNIT 3: Symmetrical Bending of Circular Plates **(4)**
Differential equation uniformly loaded plates, Plates concentricity loaded plates- loaded at the center.

UNIT 4: Rectangular Plates **(8)**
Differential equations - Solution of simply supported plate Various loading conditions, viz, uniformly distributed load, hydrostatic pressure and concentrated load, central as well as non-central, Navier and Levy type solutions with various edge boundary conditions, viz., all edges simply supported, Two opposite edge fixed and two adjacent fixed**.**

UNIT 5: **(4)**
Bending of plate under combined action of lateral and transverse loads derivation of differential equation, simply supported rectangular plate.

UNIT 6: Introduction to Shell Structures **(8)**
General description of various types. Membrane Theory of thin shells (Stress Analysis): Cylindrical shells - Spherical Shells- Shells of double curvature, Viz, cooling tower Hyperbolic, Parabolic and elliptic paraboloid.

UNIT 7: Membrane Deformation of Shells **(6)**
Symmetrically loaded shell, symmetrically loaded spherical shell. General Theory of cylindrical shells: Circular; Cylindrical shell loaded symmetrically

UNIT 8: **(2)**
General equation of circular cylindrical shells. Approximate investigation of bending of circular cylindrical shell.

Reference Books:

1. Theory of Plates and Shells, Timoshenko, Woinowsky and Krieger, McGraw Hill.
2. Stresses in Shells, Flugge, Springer Verlag, Berlin.
3. Theory of Elastic Thin Shells, Goldnvizer, Pergamon Press, New York.
4. Theory and analysis of plates, R. Szilard Prentice Hall.

MME002: ADVANCED MECHANICAL VIBRATION

LTP: 3-0-0 **Credits: 3**

UNIT 1: Review of Mechanical Vibrations **(6)**
Basic concepts; Free vibration of single degree of freedom systems with and without damping, Forced vibration of single DoF systems. Force and motion isolation. Two DoF system: natural frequency.

UNIT 2: Transient Vibration of Single Degree-of-Freedom Systems **(6)**
Impulse excitation, Arbitrary excitation, Laplace transform formulation, Pulse excitation and rise time, Shock response spectrum, Shock isolation, Finite difference numerical computation.

UNIT 3: Vibration Control **(6)**
Introduction, Vibration isolation theory, Vibration isolation theory for harmonic excitation, practical aspects of vibration analysis, shock isolation, Dynamic vibration absorbers, Vibration dampers.

UNIT 4: Vibration Measurement and Applications **(3)**
Introduction, Transducers, Vibration pickups, Frequency measuring instruments, Vibration exciters, Signal analysis.

UNIT 5: Modal analysis & Condition Monitoring **(3)**
Dynamic Testing of machines and Structures, Experimental Modal analysis, Machine Condition monitoring and diagnosis.

UNIT 6: Non Linear Vibrations **(6)**
Introduction, Sources of nonlinearity, Qualitative analysis of nonlinear systems. Phase plane, Conservative systems, Stability of equilibrium, Method of isoclines, Perturbation method, Method of iteration, Self-excited oscillations.

UNIT 7: Random Vibrations **(6)**
Random phenomena, Time averaging and expected value, Frequency response function, Probability distribution, Correlation, Power spectrum and power spectral density, Fourier transforms, FTs and response.

UNIT 8: Continuous Systems **(4)**
Vibrating string, Longitudinal vibration of rods, Torsional vibration of rods, Suspension bridge as continuous system, Euler equation for beams, Vibration of membranes.

Reference Books:

1. Theory of Vibration with Application, - William T. Thomson, Marie Dillon Dahleh, Chandramouli Padmanabhan, 5th edition, Pearson Education.
2. Fundamentals of Mechanical Vibration. S. Graham Kelly. 2nd edition, McGraw Hill.
3. Mechanical Vibrations, S. S. Rao, 4th edition, Pearson Education.
4. Mechanical Vibrations, S. Graham Kelly, Schaum's Outlines, Tata McGraw Hill, 2007

MME003: ADVANCED COMPOSITE MATERIALS

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction to Composite Materials **(4)**
Definition, Classification, Types of matrices material and reinforcements, Characteristics & selection, Fiber composites, laminated composites, Particulate composites, Prepegs, and sandwich construction.

UNIT 2: Macro Mechanics of a Lamina **(6)**
Hooke's law for different types of materials, Number of elastic constants, Derivation of nine independent constants for orthotropic material, Two - dimensional relationship of compliance and stiffness matrix. Hooke's law for two-dimensional angle lamina, engineering constants - Numerical problems. Invariant properties. Stress-Strain relations for lamina of arbitrary orientation, Numerical problems.

UNIT 3: Micro Mechanical Analysis of a Lamina **(4)**
Introduction, Evaluation of the four elastic moduli, Rule of mixture, Numerical problems.

UNIT 4: Biaxial Strength Theories **(4)**
Maximum stress theory, Maximum strain theory, Tsa-Hill theory, Tsai, Wu tensor theory, Numerical problems.

UNIT 5: Macro Mechanical Analysis of Laminate **(5)**
Introduction, code, Kirchoff hypothesis, CLT, A, B, and D matrices (Detailed derivation) Engineering constants, Special cases of laminates, Numerical problems.

UNIT 6: Manufacturing **(8)**
Lay-up and curing - open and closed mould processing, Hand lay, Up techniques, Bag moulding and filament winding. Pultrusion, Pulforming, Thermoforming, Injection moulding, Cutting, Machining and joining, tooling, Quality assurance, Introduction, material qualification, Types of defects, NDT methods.

UNIT 7: Application Developments **(6)**
Aircrafts, missiles, Space hardware, automobile, Electrical and Electronics, Marine, Recreational and sports equipment-future potential of composites.

UNIT 8: Metal Matrix Composites **(3)**
Reinforcement materials, Types, Characteristics and selection, Base metals, Selection, Applications.

Reference Books:
1. Composite Materials handbook, Mein Schwartz Mc Graw Hill Book Company, 1984.
2. Mechanics of Composite Materials, Autar K. Kaw CRC Press.
3. Mechanics of Composite Materials, Rober M. Joness Mc-Graw Hill Kogakusha Ltd.
4. Stress Analysis of Fiber Reinforced Composite Materials, Michael W, Hyer Mc-Graw Hill.
5. Composite Material Science and Engineering, Krishan K. Chawla, Springer.
6. Fibre Reinforced Composites, P.C. Mallik, Marcel Decker.

MME004: COMPUTER APPLICATIONS IN DESIGN

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction to CAD/CAM/CAE Systems (3)
Overview, Definitions of CAD. CAM and CAE, Integrating the Design and Manufacturing Processes through a Common Database-A Scenario, Using CAD/CAM/CAE Systems for Product Development-A Practical Example.

UNIT 2: Components of CAD/CAM/CAE Systems (3)
Hardware Components ,Vector-Refresh (Stroke-Refresh) Graphics Devices, Raster Graphics Devices, Hardware Configuration, Software Components, Windows-Based CAD Systems.

UNIT 3: Basic Concepts of Graphics Programming (6)
Graphics Libraries, Coordinate Systems, Window and Viewport, Output Primitives - Line, Polygon, Marker Text, Graphics Input, Display List, Transformation Matrix, Translation, Rotation, Mapping, Other Transformation Matrices, Hidden-Line and Hidden-Surface Removal, Back-Face Removal Algorithm, Depth-Sorting, or Painter's, Algorithm, Hidden-Line Removal Algorithm, z-Buffer Method, Rendering, Shading, Ray Tracing, Graphical User Interface, X Window System.

UNIT 4: Geometric Modeling Systems (5)
Wireframe Modeling Systems, Surface Modeling Systems, Solid Modeling Systems, Modeling Functions, Data Structure, Euler Operators, Boolean Operations, Calculation of Volumetric Properties, Nonmanifold Modeling Systems, Assembly Modeling Capabilities, Basic Functions of Assembly Modeling, Browsing an Assembly, Features of Concurrent Design, Use of Assembly models, Simplification of Assemblies, Web-Based Modeling.

UNIT 5: Representation and Manipulation of Curves (7)
Types of Curve Equations, Conic Sections, Circle or Circular Arc, Ellipse or Elliptic Arc, Hyperbola, Parabola, Hermite Curves, Bezier Curve, Differentiation of a Bezier Curve Equation, Evaluation of a Bezier Curve, B-Spline Curve, Evaluation of a B-Spline Curve, Composition of B-Spline Curves, Differentiation of a B-Spline Curve, Nonuniform Rational B-Spline (NURBS) Curve, Evaluation of a NURBS Curve, Differentiation of a NURBS Curve, Interpolation Curves, Interpolation Using a Hermite Curve, Interpolation Using a B-Spline Curve, Intersection of Curves.

UNIT 6: Representation and Manipulation of Surfaces (6)
Types of Surface Equations, Bilinear Surface, Coon's Patch, Bi-cubic Patch, Bezier Surface, Evaluation of a Bezier Surface, Differentiation of a Bezier Surface, B-Spline Surface, Evaluation of a-B-Spline Surface, Differentiation of a B-Spline Surface, NURBS Surface, Interpolation Surface, Intersection of Surfaces.

UNIT 7: CAD and CAM Integration (6)
Overview of the Discrete Part Production Cycle, Process Planning, Manual Approach, Variant Approach, Generative Approach, Computer-Aided Process Planning Systems, CAM-I CAPP, MIPLAN and MultiCAPP, MetCAPP, ICEM-PART, Group Technology, Classification and Coding, Existing Coding Systems, Product Data Management (PDM) Systems.

UNIT 8: Standards for Communicating Between Systems (4)
Exchange Methods of Product Definition Data, Initial Graphics Exchange Specification, Drawing Interchange Format, Standard for the Exchange of Product Data. Tutorials, Computational exercises involving Geometric Modeling of components and their assemblies

Reference Books:
1. Kunwoo Lee, "Principles of CAD/CAM/CAE Systems," Addison Wesley, 1999.

2. Radhakrishnan P. et al., “CAD/CAM/CIM,” New Age Intl, 2008.
3. Ibrahim Zeid, “CAD/CAM – Theory & Practice,” McGraw Hill, 1998.
4. Bedworth, Mark Henderson & Philip Wolfe, “Computer Integrated Design and Manufacturing” -McGraw Hill.
5. Pro-Engineer, Part Modeling Users Guide, 1998

MME005: ADVANCED OPTIMIZATION TECHNIQUES

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(8)**

Classification of optimization problems, Application of optimization, concepts of design vectors, Design constraints, constraint surface, objective function surfaces and multi-level optimization.

UNIT 2: Optimization-I **(8)**

Karmakars method of solving L.P. Problems, Quadratic programming, non-linear programming - unconstrained optimization techniques, Basics of constrained optimization.

UNIT 3: Optimization-II **(8)**

Integer linear programming methods and applications, Introduction to integer non-linear programming, Basics of non geometric programming.

UNIT 4: Optimization-III **(8)**

Multi-objective optimization methods and application, Formulation of problems - Separable programming and stochastic programming.

UNIT 5: Optimization-IV **(8)**

Introduction to Genetic algorithms, Simulated Annealing, neural network based optimization and optimization of Fuzzy systems.

Reference Books:

1. Singiresu .S. Rao, " Engineering optimization-Theory and practices " , John Wiley and Sons, 1998.
2. Ravindran - Phillips - Solberg, " Operations research - Principles and Practice ", John Wiley and Sons,
3. Fredrick S.Hiller and G.J.Liberman, " Introduction to Operations Research " , McGraw Hill Inc. 1995.

MME006: DYNAMICS OF MECHANICAL SYSTEMS

LTP: 3-0-0 **Credits: 3**

UNIT 1: Basic Concepts (6)

Inertial Coordinate System, Fundamental Laws of Motion, Mechanics of Particles and System of Particles, Principle of Linear and Angular Momenta, Work-energy principles..

UNIT 2: Lagrangian Dynamics (10)

Degrees of Freedom, Generalized Coordinates and Generalized Forces,Geometric and Differential Constraints, Holonomic and Nonholonomic Motion, Lagrange's Equation from D'Alembert's Principles, Application of Lagrange's equation for Conservative and Non-conservative Autonomous Systems with holonomic and Nonholonomic Constraints, Applications to systems with very Small Displacements and Impulsive Motion, Hamilton Principle from D'Alembert's Principle, Lagrange Equation from Hamilton's Principle.

UNIT 3: Multi-body Dynamics (10)

Space and Fixed body Coordinate Systems, Coordinate Transformation Matrix, Direction Cosines, Euler Angles, Euler Parameters, Finite and Infinitesimal Rotations, Time Derivatives of Transformations Matrices, Angular Velocity and Acceleration Vectors, Equations of Motion of Multi-Body System, Newton-Euler Equations, Planer Kinematic and Dynamic Analysis, Kinematic Revolute Joints, Coordinate Partitioning, Equations of Motion, Joint Reaction Forces, Simple Applications of Planer Systems.

UNIT 4: Stability of Motion (8)

Fundamental Concept in Stability, Autonomous Systems and Phase Plane Plots, Routh's Criteria for Stability, Liapunv's Method, Liapunov's Stability Theorems, Liapunov's Function to Determine Stability of the System.

UNIT 5: Control System Dynamics (6)

Open and Close Loop Systems, Block Diagrams, Transfer Functions and Characteristics Equations, Proportional Integral and Derivative Control actions and their Characteristics.

Reference Books:

1. “Classical Mechanics”, Goldstein, Pearson Education
2. "Advanced Engineering Dynamics", J. H. Ginsberg, Harper & Row.
3. "Methods of Analytical Dynamics", L. Meirovitch, McGraw Hill Inc.
4. "Dynamics of Physical Systems", R. H. Canon, McGraw Hill Inc.

OEM014: TRIBOLOGY

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(6)**

Introduction to Tribology, and its historical background, Industrial importance, Factors influencing, Tribological phenomena.

UNIT 2: Engineering Surfaces-Properties and Measurement **(8)**

Engineering surfaces - surface characterization, computation of surface parameters. Surface measurement techniques, Apparent and real area of contact, Contact of engineering surfaces.

UNIT 3: Surface Contact **(4)**

Hertzian and Non-hertzian contact. Contact pressure and deformation in non-conformal contacts.

UNIT 4: Friction **(6)**

Genesis of friction, friction in contacting rough surfaces, sliding and rolling friction, Various laws and theory of friction. Stick slip friction behaviour, frictional heating and temperature rise. Friction measurement techniques.

UNIT 5: Wear **(8)**

Wear and wear types. Mechanisms of wear -Adhesive, abrasive, corrosive, erosion, fatigue, fretting, etc., wear of metals and non-metals. Wear models – asperity contact, constant and variable wear rate, geometrical influence in wear models, wear damage. Wear in various mechanical components, wear controlling techniques.

UNTI 6: Lubrication **(3)**

Introduction to lubrication. Lubrication regimes. Lubricants and their properties. Solid Lubricants.

UNIT 7: Nanotribology **(5)**

Introduction to micro and nano tribology. Measurement tools used in nanotribology: SFA, STM, AFM, microscale and nanoscale wear, Nanofabrication/ nanomachining, Nanohydrodynamics, Nanolubrication Tribological issues in MEMS

Reference Books:

1. “Engineering Tribology” by Prasanta Sahoo, PHI.
2. “Engineering Tribology” by Stachowiak & Batchelor, Elsevier.
3. “Nanotribology and Nanomechanics: An Introduction” by Bharat Bhushan, Springer.
4. “Nanotribology” by Hsu & Ying, Springer.

OEM015: RENEWABLE ENERGY & ENERGY MANAGEMENT

LTP: 3-0-0 **Credits: 3**

UNIT 1: Solar Energy **(6)**

The sun as a perennial source of energy, direct solar energy utilization; solar thermal applications – water heating systems, space heating and cooling of buildings, solar cooking, solar ponds, solar green houses, solar thermal electric systems; solar photovoltaic power generation; solar production of hydrogen.

UNIT 2: Energy from Oceans **(8)**

Wave energy generation – energy from waves; wave energy conversion devices; advantages and disadvantages of wave energy; Tidal energy – basic principles; tidal power generation systems; estimation of energy and power; advantages and limitations of tidal power generation; ocean thermal energy conversion (OTEC); methods of ocean thermal electric power generation.

UNIT 3: Wind Energy **(4)**

Basic principles of wind energy conversion; design of windmills; wind data and energy estimation; site selection considerations.

UNIT 4: Hydro Power **(6)**

Classification of small hydro power (SHP) stations; description of basic civil works design considerations; turbines and generators for SHP; advantages and limitations.

UNIT 5: Biomass and Bio-fuels **(4)**

Energy plantation; biogas generation; types of biogas plants; applications of biogas; energy from wastes.

UNIT 6: Geothermal Energy **(4)**

Origin and nature of geothermal energy; classification of geothermal resources; schematic of geothermal power plants; operational and environments problems.

UNIT 7: Energy Conservation Management **(8)**

The relevance of energy management profession; general principles of energy management and energy management planning; application of Pareto's model for energy management; obtaining management support; establishing energy data base; conducting energy audit; identifying, evaluating and implementing feasible energy conservation opportunities; energy audit report; monitoring, evaluating and following up energy saving measures/projects.

Reference Books:

1. 'Renewable Energy Resources', John W Twidell and Anthony D Weir, BSP Publications, 2006.
2. 'Renewable Energy – Power for sustainable future', Edited by Godfrey Boyle. Oxford University Press, 2011.
3. 'Renewable energy sources and their environmental impact', S.A.Abbasi and Naseema Abbasi. PHI, 2001.
4. 'Renewable and novel energy sources', S.L.Sah. M.I. Publications, 1995.

MPI111: RELIABILITY ENGINEERING

LTP: 3-0-0 **Credits: 3**

UNIT 1: Reliability Concept **(8)**

Reliability function - failure rate - Mean time between failures (MTBF), Mean time to failure (MTTF*), a priori* and *a posteriori* concept - mortality curve, useful life availability, maintainability - system effectiveness.

UNIT 2: Reliability Data Analysis **(8)**

Time to failure distributions - Exponential, Normal, Gamma, Weibull, ranking of data - probability plotting techniques - Hazard plotting.

UNIT 3: Reliability Prediction Models **(8)**

Series and parallel systems - RBD approach, Standby systems - m/n configuration, Application of Baye's theorem - cut and tie set method - Markov analysis, FTA - Limitations.

UNIT 4: Reliability Management **(8)**

Reliability testing - Reliability growth monitoring, Non parametric methods - Reliability and life cycle costs - Reliability allocation, Replacement model.

UNIT 5: Risk Assessment **(8)**

Definition and measurement of risk - risk analysis techniques, Risk reduction resources, industrial safety and risk assessment.

Reference Books:

1. Modarres, "Reliability and Risk analysis ", Mara Dekker Inc., 1993.
2. Smith C.O." Introduction to Reliability in Design ", McGraw Hill, London, 1976.
3. John Davidson, "The Reliability of Mechanical system ", Institution of Mechanical Engineers, London, 1988.

M.Tech.

in

Mechanical Engineering

with specialization in

Thermal Engineering

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Mechanical and Automobile Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Mechanical and Automobile Engineering
School:	School of Engineering and Technology
Name of the Course:	M.Tech. in Mechanical Engineering with Specialization in Thermal Engineering
Duration:	Two (02) years
Total number of Credits:	66
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. G. P. Sinha, HOD, ME&AE, Chairman 2. Prof. D.V. Singh, Fmr. Dir., IIT-R, Ext. Member 3. Prof. S. Prasad, Advisor, GLA Bajaj, Special Invitee 4. Prof. P.K. Sinha, Prof. Emer., ME&AE, Int. Member 5. Prof. R.C. Sachdeva, Dist. ME&AE, Int. Member 6. Prof. Y.V. Satya Kumar, ME&AE, Int. Member 7. Prof. Subhash Kamal, ME&AE, Int. Member 8. Dr. A. Singh, Assoc. Prof., ME&AE, Int. Member 9. Mr. Manish Kr. Yadav, Asst. Prof., Int. Member 10. Mr. Umesh Kr. Jha, Asst. Prof, Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by the BOS and Faculty Board

COURSE STRUCTURE

M. Tech. in Mechanical Engineering with Specialization in Thermal Engineering

SEMESTER	Courses (L-T-P) Credits							L. Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Finite Element Methods (3-1-0) 4	Heat and Mass Transfer (3-1-0) 4	Instrumentation & Control (3-0-0) 3	Advanced Materials Engineering (3-0-0) 3	Advanced Mechanics of Fluids (3-0-0) 3	Foreign Language (1-0-2) 2	CAD Lab (0-0-4) 2	**6**	**16**	**2**	**6**	**24**	**21**
II	Gas Turbines and Compress-ors (3-0-0) 3	Open Elective (3-0-0) 3	Advanced Thermodynamic s (3-0-0) 3	Department-al Elective-1 (3-0-0) 3	Department-al Elective-2 (3-0-0) 3	Technical presentatio-n (1-0-2) 2	Thermal Lab (0-0-4) 2	**6**	**16**	**0**	**6**	**22**	**19**
III	Technical Seminar (0-0-2) 2	Project (0-0-4) 4	Dissertation-I (0-0-15) 8					**0**	**0**	**0**	**21**	**21**	**14**
IV	Disserta-tion (0-0-21) 12							**0**	**0**	**0**	**21**	**21**	**12**

Total Credits – 66

Core Subjects

1. Finite Element Methods
2. Heat and Mass Transfer
3. Instrumentation and Control
4. Advanced Materials Engineering

Specialization (Thermal Engineering) Core Subjects

1. Advanced Mechanics of Fluids
2. Gas Turbines and Compressors
3. Advanced Thermodynamics

Departmental Electives (Any Two)

1. Theory of I. C. Engines
2. Optimal Design of Thermal Systems
3. Computational Methods in Fluid Flow and Heat Transfer
4. Advanced Power Plant Engineering
5. Refrigeration and Air Conditioning System Design
6. Fuels and Combustion

Open Electives

1. Tribology
2. Renewable Energy and Energy Management
3. Reliability Engineering

M.Tech.

in

Mechanical Engineering

with specialization in

Thermal Engineering

SYLLABI

MME101: FINITE ELEMENT METHODS

LTP: 3-1-0 **Credits: 4**

UNIT 1: Approximate Solution Methods (8)

Ritz and Rayleigh Ritz methods, Method of weighed residuals, General concepts, Point collocation, Subdomain collocation, Least squares, Galerkin method.

UNIT 2: Finite Difference Method (8)

Characteristics and classification of PDE, Solution of elliptic, Hyperbolic & parabolic PDE using Finite Difference Method.

UNIT 3: Introduction to Finite Element Method (12)

Introduction to variational calculus, The differential of a function; Euler-Lagrange equation, Geometric & natural boundary conditions, Basic Concept of Finite Element Method, Principle of potential energy; 1D elements, Derivation of Stiffness and Mass matrices for a bar, A beam and A shaft, Comparison with Analytical results; Interpolation and Shape functions; Solution of static problems and case studies in stress analysis of Mechanical components; FEA using 2D and 3D elements; Plain strain and plain stress problems, FE using plates / shell elements.

UNIT 4: Isoparametric Elements and Analysis (4)

Isoparametric Elements.

UNIT 5: Importance of Finite Element Mesh (8)

Automatic meshing techniques; Case studies using FEM for Design of simple element geometries such as a tapered bar, A plate with a hole.

Laboratory Work:

Practice of the concept covered in Lecture. Use of software for Finite Element Analysis.

Reference Books:

1. Reddy, J. N., An Introduction to the Finite Element Method, McGraw Hill, 2001.
2. Bathe, K. J., Finite Element Procedures, PHI, 1996.
3. Chandrupatla, T. R. and Belgundu, A. D., Introduction to Finite Elements in Engineering, PHI, 1997.
4. Zienkiewicz, O. C., The Finite Element Method, McGraw Hill, 2002.
5. Huebner, K. H., Dewhirst, D. L., Smith, D. E. and Byrom, T. G., The Finite Element Methods for Engineers, John Wiley and Sons, 2000.
6. Buchman, G. R., Finite Element Analysis, Schaum's Outlines, McGraw Hill, 1995.
7. Jordan, C. Calculus of Finite Differences, American Mathematical Society, 1979.

MME102: HEAT AND MASS TRANSFER

LTP: 3-1-0 **Credits: 4**

UNIT 1: Conduction **(10)**

Review of the basic laws of conduction, convection and radiation. General heat conduction equation in different co-ordinates. One dimensional steady state conduction with variable. Thermal conductivity and with internal distributed heat sources, extended surfaces review, Tapered fins, design considerations. Two dimensional steady-state conduction, semi-infinite and finite flat plates and cylinders, graphical method, relaxation technique. Unsteady state conduction in solids with infinite thermal conductivity, infinite thick-solids, periodic variation, solutions using Grolber's and Heisfer's charts.

UNIT 2: Convection **(8)**

Hydrodynamic and thermal boundary layers, differential equations, momentum and energy and their solutions, heat transfer in turbulent flow, eddy heat diffusivity, Reynold's analogy between skin friction and heat transfer. Free convection, empirical correlations, regimes of boiling, Nucleate and film boiling.

UNIT 3: Heat Exchangers **(4)**

Introductions, effectiveness and number of transfer units, design of heat exchangers.

UNIT 4: Radiation **(8)**

Introduction, laws of radiation, heat exchange between black bodies and non-black bodies, shape factor algebra, Radiation shields, electrical net-work approach of radiation heat exchange.

UNIT 5: Mass Transfer **(6)**

Introduction, Fick's law, General equation of mass diffusion steady state, diffusion through a plain membrane, diffusion of water vapour through air, Mass transfer coefficient, convective mass transfer, boundary layer governing equations, momentum heat & mass transfer analogies, mass transfer correlations.

UNIT 6: Heat Pipe **(4)**

Introduction, Working of Heat pipe, Different types of Heat Pipe, Detail of Heat Pipe components, Advantages of Heat Pipe, Application of Heat Pipe, Performance of Heat Pipe, Limitation of Heat Pipe, Analysis and Design of Heat Pipe.

Reference Books:

1. Fundamentals of Engineering Heat & Mass Transfer by R. C. Sachdeva, New Age Publishers.
2. Heat Transfer by Holman.
3. Principles of Heat Transfer by Kreith, McGraw Hill.
4. Transport phenomena by Bird, John Wiley.

MME103:INSTRUMENTATION & CONTROL

LTP: 3-0-0 **Credits: 3**

UNIT 1: Measurements and Measurement Systems (6)

Introduction, significance of measurement, methods of measurement, primary secondary and tertiary measurements, mechanical electrical and electronics instruments, applications of measurement system, elements of a generalized measurement system and its functional elements, classifications of standards, primary, secondary and working standards.

UNIT 2: Instrumentation Characteristics (4)

Static and dynamic characteristics, first and second order systems response, classification & sources of error, loading facts, mechanical, electrical

UNIT 3: Analysis of Experimental Data (6)

Errors and uncertainties in experiments, role of statistics and variance types of data, presentation of the observations, criteria for rejecting data, specifying result of experiments, confidence level, uncertainty analysis, overall uncertainty, graphical analysis and curve fitting, theory of least squares, application in calibration, goodness of fit, significant figures and rounding off.

UNIT 4: Transducers (8)

General criteria for selection, strain gauge, rosettes; types, applications. Variable inductance transducers, capacitive, piezo-electric transducers, transducers. Advantages and limitations of digital transducers over analog transducers, digital encoding transducers, classification of encoders, construction of encoders, shaft encoder, optical encoder.

UNIT 5: Control Systems (6)

Introduction, types of control systems, performance analysis, mathematical modeling, block diagram representation, representation of systems or processes, comparison elements, transfer function, representation of temperature control systems, signal flow graphs.

UNIT 6: Types of Controllers (4)

Introduction, types of control action, hydraulic controllers, electronic controllers, controllers.

UNIT 7: Transient and Steady State Response (6)

Time domain representation, laplace transform representation, system with proportional control, proportional cum derivative control, proportional cum integral control, error constants.

Reference Books:

1. Instrumentation for Measurement in Engineering by S. Gupta
2. Theory and application of Automatic Controls by B.C. Nakra.
3. A course in Mechanical Measurement & Instrumentation by A.K. Sawhney, D.R Publisher.
4. Mechanical Measurement by Beckwith & Buck

MME104: ADVANCED MATERIALS ENGINEERING

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(8)**

Retrospective of materials science in Engineering; Classification and importance of materials; Traditional engineering materials, Modern engineering materials, Advanced materials, Biomaterials, Nano-materials, Future materials.

UNIT 2: Polymers **(10)**

Definitions and types of polymers, Synthesis, processing and fabrication of polymers, Behavior of polymers: Crystallization, melting, glass transition, anelasticity, mechanisms of deformation and strengthening; Applications in structural, electrical and functional domains.

UNIT 3: Ceramics **(8)**

Definitions and types of ceramics, Traditional and Advanced Ceramics, Synthesis, Processing and fabrication of ceramics. Fracture mechanics of structural ceramics, Applications in structural, electrical and functional domains.

UNIT 4: Composites **(10)**

Refresher of Miller indices for cubic and non-cubic systems, anisotropic elasticity; Definition of composites, Elastic behavior of composites; Types of matrices, reinforcement and interfaces; Types of composites: PMCs, MMCs, CMCs, IMCs, SMCs and Nano-composites; Applications in natural, biological, structural and functional systems.

UNIT 5: Case Studies **(4)**

Case studies of development of space materials, superconducting materials, biomaterials, nanomaterials and future materials.

Reference Books:

1. Callister's Materials Science and Engineering: Indian Adaptation (W/Cd), by R.Balasubramaniam, Wiley India.
2. Introduction to Polymers, Robert J. Young, Peter A. Lovell, CRC Press.
3. Introduction to Ceramics, W. David Kingery, H. K. Bowen, Donald R. Uhlmann, John Wiley & Sons.
4. Composite Materials: Science and Engineering, Krishan Kumar Chawla, Springer.
5. Biomaterials Science: An Introduction to Materials in Medicine, Buddy D. Ratner, Academic Press
6. Indicated Research Publication and Class Notes.

MME108: ADVANCED MECHANICS OF FLUIDS

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(4)**
Review of basic concepts.

UNIT 2: Integral Analysis of Flow **(4)**
Basic laws in integral form; transport theorem; continuity, momentum and energy equations in integral form and their applications.

UNIT 3: Differential Analysis of Flow **(4)**
Continuity equation; derivation of Navier-Stokes equation and Exact Solutions of Energy equation.

UNIT 4: Viscous Flow **(10)**
Exact solution; plane Poiselle and Coutte flows; Hagon-Poiselle flow through pipes; flows with very small Reynold's numbers; Stokes flow around a sphere; Flows with very large Reynold's numbers; elements of two dimensional boundary layer theory; displacement thickness and momentum thickness and energy thickness; skin friction; Blaussius solution for boundary layer on a flat plate with & without pressure gradient; Von-Karman integral method. Drag on bodies; form drag and skin friction drag; profile drag and its measurement.

UNIT 5: Transition Flows **(4)**
Transition from laminar to turbulent flows, Reynold's stresses, turbulent boundary layer over a flat plate; transition for flat plate flow, Intensity of turbulence.

UNIT 6: Compressible Fluid Flows **(8)**
One dimensional isentropic flow; Fanno and Rayleigh lines; choking; shocks (normal and oblique).

UNIT 7: Vortex Motion **(6)**
Definitions; vortex lines; surfaces and tubes; vorticity; circulation; Kelvins circulation theorem; Helmholtzs vorticity theorem; Biot-savart law for induced vorticity; system of vortex filaments; horse-shoe vortex filaments; ring vortices; vortes sheets; karman vortex sheet.

Reference Books:

1. Foundation of Fluid Mechanics, Yuan, Prentice Hall
2. Engineering fluid mechanics, K. L. Kumar, Eurasia
3. Boundary Layer Theory by Schlichting, McGraw-Hill
4. Fundamentals of Mechanics of Fluid by Curriec, McGraw-Hill
5. Fluid Mechanics and its applications, Gupta and Gupta, Willey Eastern

MME109: GAS TURBINES AND COMPRESSORS

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(12)**

Development, Classification and field of application of gas turbines, Gas turbine cycle; Multistage compression, Reheating, Regeneration combined and cogeneration. Energy transfer between fluid and rotor, Axi-symmetric flow in compressors and gas turbines

UNIT 2: Turbines **(14)**

Classification - axial flow and radial flow turbines, Impulse and reaction turbines, Elementary vortex theory, Aerodynamic and thermodynamic design considerations; Blade materials, Blade attachments and cooling. Gas turbine power plants, Combustion systems, Design considerations, Flame stabilization, Plant performance and matching, Applications

UNIT 3: Compressors **(14)**

Classification, Centrifugal compressors, Adiabatic efficiency, Slip factor, Design consideration for impeller and diffuser systems, Performance characteristics, Axial flow compressors, Vortex theory, Degree of reaction, Simple design, Aerofoil theory, Cascade theory, Stages, Stage efficiency and overall efficiency, Performance characteristics.

Reference Books:

1. Ganesan, V., Gas Turbines, Tata McGraw-Hill, 1999.
2. Cohen, H., Rogers, G.E.C., and Saravanamuttoo, H.I.H., Gas Turbine Theory, Longman
3. Yahya, S.H. Turbines, Compressors and Fans, Tata McGraw-Hill
4. Gordon, C. D., Aero-thermodynamics of Gas Turbine and Rocket Propulsion, AIAA Education Series
5. Earl Logan, Jr., Handbook of Turbomachinery, Marcel Dekker, Inc.
6. Dixon, S.L., Fluid Mechanics and Thermodynamics of Turbomachinery, Pergamon Press

MME110: ADVANCED THERMODYNAMICS

LTP: 3-0-0 **Credits: 3**

UNIT 1: **(8)**

Availability, Irreversibility and Second-Law Efficiency for a closed System and steadystate Control Volume. Availability, Analysis of Simple Cycles. Thermodynamic Potentials, Maxwell relations, Generalised relation for changes in Entropy, Internal Energy and Enthalpy, Generalised Relations for Cp and Cv, Clausius Claypeyron Equation, Joule-Thomson Coefficient, Bridgman Tables for thermodynamic relations.

UNIT 2: **(10)**

Different Equations of State, Fugacity, Compressibility, Principle of Corresponding States, Use of generalized charts for enthalpy and entropy departure, fugacity coefficient, Lee-Kesler generalized three parameter tables. Fundamental property relations for systems of variable composition, partial molar prosperities, Real gas mixtures, Ideal solution of real gases and liquids, Equilibrium in multi phase systems, Gibbs phase rule for non-reactive components.

UNIT 3: **(7)**

Thermo chemistry, first Law analysis of reacting systems, Adiabatic Flame temperature, Entropy change of reacting systems, Second Law analysis of reacting systems, Criterion for reaction equilibrium composition.

UNIT 4: **(8)**

Microstates and Macrostates, Thermodynamic probability, Degeneracy of energy levels, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein Statistics, Microscopic Interpretation of heat and work, Evaluation of entropy, Partition function, Calculation of the Microscopic properties from partition functions. Collision Theory and Transport properties.

UNIT 5: **(7)**

Conjugate Fluxes and Forces, Entropy Production, Onsager's Reciprocity relations, thermo-electric phenomena and formulations. Thermodynamics of High-Gas flow.

Reference Books:

1. Kenneth Wark Jr., Advanced Thermodynamics for Engineers, McGraw-Hill Inc., 2001.
2. Bejan, A., Advanced Engineering Thermodynamics, John Wiley and Sons, 1998.
3. Holman, J.P., Thermodynamics, Fourth Edition, McGraw-Hill Inc., 1998.
4. Smith, J.M and Van Ness., H.C., Introduction to Chemical Engineering Thermodynamics, Fourth Edition, McGraw-Hill Inc., 1987.
5. Sonntag, R.E., and Vann Wylen, G, Introduction to Thermodynamics: Classical and Statistical, Third Edition, John Wiley and Sons, 1991.
6. Sears, F.W. and Salinger G.I., Thermodynamics, Kinetic Theory and Statistical Thermodynamics, Third Edition, Narosa Publishing House, New Delhi, 1993.
7. DeHoft, R.T. Thermodynamics in Materials Science, McGraw-Hill Inc., 1993.

MME007: THEORY OF IC ENGINES

LTP: 3-0-0 **Credits: 3**

UNIT 1: Engine Design and Operating Parameters **(8)**
Engine characteristics, geometrical properties of reciprocating engines, brake torque, indicated work, road load power, m.e.p., s.f.c. and efficiency, specific emissions and emission index, relationships between performance parameters, Engine design and performance data.

UNIT 2: Alternate Fuels for I.C. Engines **(4)**
Vegetable oils, alcohols, L.P.G, C.N.G, properties, emission characteristics, F/A ratio.

UNIT 3: SI Engines, Fuel metering, Manifold Phenomena **(6)**
S.I. Engine mixture requirements, carburetors, fundamentals and design, fuel injection systems, feedback systems, flow past throttle plate, flow in-take manifold.

UNIT 4: Combustion in IC Engines **(8)**
Combustion in SI Engines – Flame front propagation, flame speed, rate of pressure rise, knock in SI engines; combustion in CI engines – ignition delay period, rapid and controlled combustion, factors affecting delay period, knock in CI engines.

UNIT 5: Engine Operating Characteristics **(8)**
Engine performance parameters, Effect of spark-timing, Mixture composition, load and speed and compression ratio on engine performance, efficiency and emissions, SI engine combustion chamber design and optimization strategy, Testing of SI engine.

UNIT 6: Engine Emissions and their Control **(6)**
Air pollution due to IC engines, Euro norms I & II, engine emissions, emission control methods – thermal converters, catalytic converters, particulate traps, Ammonia injection systems, exhaust gas recirculation.

Reference Books:

1. V. Ganesan, “Internal Combustion Engines”, Tata McGraw-Hill
2. John B. Heywood, “IC Engines Fundamentals”, McGraw-Hill
3. C.R. Fergusan, “Internal Combustion Engines: Applied Thermosciences”, John Wiley & Sons.

MME008: OPTIMAL DESIGN OF THERMAL SYSTEMS

LTP: 3-0-0 **Credits: 3**

UNIT 1: Design of Thermal System **(8)**
Design Principles, Workable systems, Optimal systems, Matching of system components, Economic analysis, Depreciation, Gradient present worth factor.

UNIT 2: Mathematical Modeling **(8)**
Equation fitting, Empirical equation, Regression analysis, Different modes of mathematical models, Selection, Computer programmes for models.

UNIT 3: Modeling Thermal Equipments **(8)**
Modeling heat exchangers, Evaporators, Condensers, Absorption and rectification columns, Compressor, Pumps, Simulation studies, Information flow diagram, Solution procedures.

UNIT 4: Systems Optimization **(8)**
Objective function formulation, Constraint equations, Mathematical formulation, Calculus method, Dynamic programming, Geometric programming, Linear programming methods, Solution procedures.

UNIT 5: Dynamic Behavior of Thermal System **(8)**
Steady state simulation, Laplace transformation, Feedback control loops, Stability analysis, Non-linearties.

Reference Books:

1. W F Stocker, Design of Thermal System, McGraw-Hill
2. Hodge, B.K. and Taylor, R. P., Analysis and Design of Energy Systems, Prentice Hall
3. Bejan, A., Tsatsaronis, G. and Michel, M., Thermal Design and Optimization, John Wiley & Sons
4. Jaluria, Y., Design and Optimization of Thermal Systems, McGraw-Hill, 1998

MME009: COMPUTATIONAL METHODS IN FLUID FLOW AND HEAT TRANSFER

LTP: 3-0-0 **Credits: 3**

UNIT 1: **(10)**

Experimental, theoretical and numerical methods of predictions; physical and mathematical classifications partial differential equations; computational economy; numerical stability; validation of numerical results; round-off-error and accuracy of numerical results; iterative convergence, condition for convergence, rate of convergence; under – and over – relaxations, termination of iteration; tridiagonal matrix algorithm; discretization – converting derivatives to their finite difference forms – Taylor's series approach, polynomial fitting approach; discretization error.

UNIT 2: **(10)**

Steady one-dimensional conduction in Cartesian and cylindrical coordinates; handling of boundary conditions; two – dimensional steady state conduction problems in Cartesian and cylindrical co-ordinates– point-by-point and line-by-line method of solution, dealing with Dirichlet, Neumann, and Robins type boundary conditions; formation of discretized equations for regular and irregular boundaries and interfaces; grid generation methods; adaptive grids.

UNIT 3: **(10)**

One-, two, and three-dimensional transient heat conduction problems in Cartesian and cylindrical co-ordinates – explicit, implicit, Crank-Nicholson and ADI schemes; stability criterion of these schemes; conservation form and conservative property of partial differential and finite difference equations; consistency, stability and convergence for marching problems; discrete perturbation stability analysis, Fourier or von Neumann stability analysis.

UNIT 4: **(10)**

Finite volume method for diffusion and convection–diffusion problems – steady one-dimensional convection and diffusion; upwind, hybrid and power-law schemes, discretization of equation for two-dimension, false diffusion; computation of the flow field using stream function–vorticity formulation; SIMPLE, SIMPLER, SIMPLEC and QUICK schemes, solution algorithms for pressure–velocity coupling in steady flows; numerical marching techniques, two-dimensional parabolic flows with heat transfer.

Reference Books:

1. Patankar, S. V., Numerical Heat Transfer and Fluid Flow, Hemisphere
2. Anderson, D. A, Tannehill, J. C., and R. H. Pletcher, R. H., Computational Fluid Mechanics and Heat Transfer, Second Edition, Taylor & Francis
3. Muraleedhar, K. and T. Sundararaja, T. (eds.), Computational Fluid Flow and Heat Transfer, Second Edition, Narosa Publishing House
4. Versteeg, H. K. and W. Malalasekera, W., An Introduction to Computational Fluid Dynamics: The Finite Volume Method, Addison Wesley – Longman, 1995.
5. Hornbeck, R. W., Numerical Marching Techniques for Fluid Flows with Heat Transfer, NASA.

MME010:ADVANCED POWER PLANT ENGINEERING

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(6)**

Energy sources for generation of electric power, Types of power plant-their special features and applications, Present status and future trends.

UNIT 2: Hydroelectric Power Plant **(6)**

Hydroelectric Turbines, Civil Engineering Aspects like hydroelectric survey, Rainfall run-off, Hydrograph, Flow duration curve, Mass curve, Storage capacity.

UNIT 3: Thermal Power Plant **(8)**

General Introduction, Site selection, Coal-its storage, Preparation, Handling, Feeding and burning, Ash handling, Dust collection, Electrostatic Precipitators. Review of Steam Turbines: Flow of steam through turbine stage, Determination of nozzle and blade dimensions, Construction of nozzle and diaphragms, Turbine blades, Blade attachments, Gland and packaging devices, Axial thrust balancing, Regenerative and reheating and water extraction cycles.

UNIT 4: Recent Advancement in Thermal Power Systems **(2)**

Fluidized Bed Combustion, IGCC, Supercrictical Cycles.

UNIT 5: Gas Turbine Power Plant **(4)**

Field of use, Components, Plant Layout, Comparison with steam power plants, Operation of combined steam and gas power plants.

UNIT 6: Nuclear Power Plant **(6)**

Nuclear fuels, Nuclear energy, Main components of nuclear power plant layout, Nuclear reactors-types and applications, Radiation shielding, Radio-active waste disposal, Safety aspects.

UNIT 7: Power Plant Economics **(8)**

Load curves, Terms and definitions, Effect of load on power plant design, Methods to meet variable load, Prediction of load, Cost of electrical energy, Selection of types of generation and generating equipment, Performance and operating characteristics of power plants, Load division among generators and prime movers, Tariff methods of electrical energy.

Reference Books:

1. Nag, P. K., Power Plant Engineering, McGraw-Hill
2. Wakil, M. M., Power Plant Engineering, McGraw-Hill
3. Drbal, L., Westra, K. and Boston, P., Power Plant Engineering, Springer Science Inc
4. Rai, G. D., An Introduction to Power Plant Engineering, Khanna Publishers
5. Kearton, W. J., Steam Turbine Theory and Practice, ELBS Publication

MME011: REFRIGERATION AND AIR CONDITIONING SYSTEM DESIGN

LTP: 3-0-0 **Credits: 3**

UNIT 1: Vapour Compression System **(6)**
Evolving Vapor Compression Cycle from Basic Carnot Cycle – Analysis, Classification of Refrigerants, Refrigerant Properties, Oil Compatibility, Blends, Eco Friendly Refrigerants. Multipressure Systems, Cascade Systems. Air Refrigeration Cycles.

UNIT 2: System Components and Accessories **(6)**
Types of Evaporators, Compressors, Condensers, Expansion Devices, Driers/ Filters, Receiver, Accumulator, Functional Aspects of the above components & accessories, Estimation of Cooling Load, system Equilibrium and Cycling Controls, Capacity Control in Compressors.

UNIT 3: Vapor Absorption System **(3)**
Aqua Ammonia & LiBr Systems, Steam Jet Refrigeration, Thermo Electric Refrigeration.

UNIT 4: Air Conditioning **(3)**
Applied Psychometry, Psychometric processes using chart.

UNIT 5: Load Estimation **(6)**
Solar heat gain, Study of various sources of the internal and external heat gains, heat losses, etc. Methods of heat load calculations: Equivalent Temperature Difference Method, Cooling Load Temperature Difference, and Radiance Method, RSHF, GSHF, ESHF, etc. Inside and outside design conditions.

UNIT 6: Air Distribution **(6)**
Fundamentals of air flow in ducts, Pressure drop calculations, Design ducts by velocity reduction method, Equal friction method and static regain method, Duct materials and properties, Insulating materials, Types of grills, Diffusers, Wall registers, etc. VAV.

UNIT 7: Ventilation and Infiltration: **(3)**
Requirement of ventilation air, Various sources of Infiltration air, Ventilation and infiltration as a part of cooling load.

UNIT 8: Fans and Blowers **(2)**
Types, Performance characteristics, Series and parallel arrangement, Selection procedure.

UNIT 9: Application of Refrigeration and Air Conditioning **(5)**
Cold storage, Air Conditioning in Automobiles, Railway Wagons, Marine Vessels, Aircraft and other Commercial Applications, Passive Concepts in Building.

Reference Books:

1. Stoecker, W. F., Refrigeration and Air conditioning, McGraw Hill
2. C. P. Arora, Refrigeration and Air Conditioning, Tata McGraw Hill

3. ASHRE Handbook
4. Dossat, R.J., Principles of refrigeration, John Wiley and Sons
5. Goshnay, W.B., Principles and Refrigeration, Cambridge University Press
6. Langley, B. C., Solid State Electronic Controls for HVACR, Prentice Hall
7. Manohar Prasad, Refrigeration and Air Conditioning, New Age International Publishers

MME012: FUELS AND COMBUSTION

LTP: 3-0-0 **Credits: 3**

UNIT 1: Fuels
Introduction and Classification. **(4)**

UNIT 2: Solid Fuels **(8)**
Coal and its classification, Composition of coal, Analysis and Properties of Coal, Natural Coke, Oxidation and Hydrogenation of Coal, Processing of Solid Fuels: Coal preparation, coal storage, Coal carbonization and gasification, Briquetting, Gasification and Liquefaction of solid fuels.

UNIT 3: Liquid Fuels **(8)**
Petroleum-origin and Production, Composition and classification of Petroleum, Processing of Petroleum, Properties of various petroleum products, Petroleum refining, Liquid fuels from sources other than petroleum.

UNIT 4: Gaseous Fuels **(6)**
Natural Gas, Methane from Coal mines, Producer gas, Water gas, Coal gas, Blast furnace gas, Refinery gases, LPG, Cleaning and Purification of Gaseous Fuels.

UNIT 5: Combustion **(8)**
Principles of combustion, Combustion of oil, Coal and gas, Combustion equations, Stoichiometric fuel air ratio, Exhaust and flue gas analysis, Practical analysis of combustion products, Dissociation, Internal energy and enthalpy of reaction, Enthalpy of formation, Calorific value of fuels, Air and fuel-vapour mixtures.

UNIT 6: Combustion related Pollution **(6)**
Sources and Effect - Acid Rain, Air Sampling and Measurement, Pollutants: classification, Sampling, Monitoring and control, Analyzers for different pollutants.

Reference Books:

1. Sarkar, S., Fuels and combustion, McGraw-Hill
2. Theodore, L., Air Pollution Control Equipment Calculations, John Wiley and Sons
3. Eastop and McConkey, Applied Thermodynamics, Pearson Education
4. Glassman, I., Combustion, Academic Press, 2008

OME014: TRIBOLOGY

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(6)**

Introduction to Tribology, and its historical background, Industrial importance, Factors influencing, Tribological phenomena.

UNIT 2: Engineering Surfaces-Properties and Measurement **(8)**

Engineering surfaces - surface characterization, computation of surface parameters. Surface measurement techniques, Apparent and real area of contact, Contact of engineering surfaces.

UNIT 3: Surface Contact **(4)**

Hertzian and Non-hertzian contact. Contact pressure and deformation in non-conformal contacts.

UNIT 4: Friction **(6)**

Genesis of friction, friction in contacting rough surfaces, sliding and rolling friction, Various laws and theory of friction. Stick slip friction behaviour, frictional heating and temperature rise. Friction measurement techniques.

UNIT 5: Wear **(8)**

Wear and wear types. Mechanisms of wear -Adhesive, abrasive, corrosive, erosion, fatigue, fretting, etc., wear of metals and non-metals. Wear models – asperity contact, constant and variable wear rate, geometrical influence in wear models, wear damage. Wear in various mechanical components, wear controlling techniques.

UNTI 6: Lubrication **(3)**

Introduction to lubrication. Lubrication regimes. Lubricants and their properties. Solid Lubricants.

UNIT 7: Nanotribology **(5)**

Introduction to micro and nano tribology. Measurement tools used in nanotribology: SFA, STM, AFM, microscale and nanoscale wear, Nanofabrication/ nanomachining, Nanohydrodynamics, Nanolubrication Tribological issues in MEMS

Reference Books:

1. “Engineering Tribology” by Prasanta Sahoo, PHI.
2. “Engineering Tribology” by Stachowiak & Batchelor, Elsevier.
3. “Nanotribology and Nanomechanics: An Introduction” by Bharat Bhushan, Springer.
4. “Nanotribology” by Hsu & Ying, Springer.

OME015: RENEWABLE ENERGY & ENERGY MANAGEMENT

LTP: 3-0-0 **Credits: 3**

UNIT 1: Solar Energy **(6)**

The sun as a perennial source of energy, direct solar energy utilization; solar thermal applications – water heating systems, space heating and cooling of buildings, solar cooking, solar ponds, solar green houses, solar thermal electric systems; solar photovoltaic power generation; solar production of hydrogen.

UNIT 2: Energy from Oceans **(8)**

Wave energy generation – energy from waves; wave energy conversion devices; advantages and disadvantages of wave energy; Tidal energy – basic principles; tidal power generation systems; estimation of energy and power; advantages and limitations of tidal power generation; ocean thermal energy conversion (OTEC); methods of ocean thermal electric power generation.

UNIT 3: Wind Energy **(4)**

Basic principles of wind energy conversion; design of windmills; wind data and energy estimation; site selection considerations.

UNIT 4: Hydro Power **(6)**

Classification of small hydro power (SHP) stations; description of basic civil works design considerations; turbines and generators for SHP; advantages and limitations.

UNIT 5: Biomass and Bio-fuels **(4)**

Energy plantation; biogas generation; types of biogas plants; applications of biogas; energy from wastes.

UNIT 6: Geothermal Energy **(4)**

Origin and nature of geothermal energy; classification of geothermal resources; schematic of geothermal power plants; operational and environments problems.

UNIT 7: Energy Conservation Management **(8)**

The relevance of energy management profession; general principles of energy management and energy management planning; application of Pareto's model for energy management; obtaining management support; establishing energy data base; conducting energy audit; identifying, evaluating and implementing feasible energy conservation opportunities; energy audit report; monitoring, evaluating and following up energy saving measures/projects.

Reference Books:

1. 'Renewable Energy Resources', John W Twidell and Anthony D Weir, BSP Publications, 2006.
2. 'Renewable Energy – Power for sustainable future', Edited by Godfrey Boyle. Oxford University Press, 2011.
3. 'Renewable energy sources and their environmental impact', S.A.Abbasi and Naseema Abbasi. PHI, 2001.
4. 'Renewable and novel energy sources', S.L.Sah. M.I. Publications, 1995.

MPI111: RELIABILITY ENGINEERING

LTP: 3-0-0 **Credits: 3**

UNIT 1: Reliability Concept **(8)**

Reliability function - failure rate - Mean time between failures (MTBF), Mean time to failure (MTTF*), a priori* and *a posteriori* concept - mortality curve, useful life availability, maintainability - system effectiveness.

UNIT 2: Reliability Data Analysis **(8)**

Time to failure distributions - Exponential, Normal, Gamma, Weibull, ranking of data - probability plotting techniques - Hazard plotting.

UNIT 3: Reliability Prediction Models **(8)**

Series and parallel systems - RBD approach, Standby systems - m/n configuration, Application of Baye's theorem - cut and tie set method - Markov analysis, FTA - Limitations.

UNIT 4: Reliability Management **(8)**

Reliability testing - Reliability growth monitoring, Non parametric methods - Reliability and life cycle costs - Reliability allocation, Replacement model.

UNIT 5: Risk Assessment **(8)**

Definition and measurement of risk - risk analysis techniques, Risk reduction resources, industrial safety and risk assessment.

Reference Books:

1. Modarres, "Reliability and Risk analysis ", Mara Dekker Inc., 1993.
2. Smith C.O." Introduction to Reliability in Design ", McGraw Hill, London, 1976.
3. John Davidson, "The Reliability of Mechanical system ", Institution of Mechanical Engineers, London, 1988.

M.Tech.

in

Mechanical Engineering

with specialization in

Production and Industrial Engineering

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Mechanical and Automobile Engineering
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Mechanical and Automobile Engineering
School:	School of Engineering and Technology
Name of the Course:	M.Tech. in Mechanical Engineering with Specialization in Production and Industrial Engineering
Duration:	Two (02) years
Total number of Credits:	66
Date of Meeting of BOS:	July 12, 2012
Members of BOS:	1. Prof. G. P. Sinha, HOD, ME&AE, Chairman 2. Prof. D.V. Singh, Fmr. Dir., IIT-R, Ext. Member 3. Prof. S. Prasad, Advisor, GLA Bajaj, Special Invitee 4. Prof. P.K. Sinha, Prof. Emer., ME&AE, Int. Member 5. Prof. R.C. Sachdeva, Dist. ME&AE, Int. Member 6. Prof. Y.V. Satya Kumar, ME&AE, Int. Member 7. Prof. Subhash Kamal, ME&AE, Int. Member 8. Dr. A. Singh, Assoc. Prof., ME&AE, Int. Member 9. Mr. Manish Kr. Yadav, Asst. Prof., Int. Member 10. Mr. Umesh Kr. Jha, Asst. Prof, Int. Member
Date of Meeting of Faculty Board:	July 18, 2012
Status:	Approved by the BOS and Faculty Board

COURSE STRUCTURE

M. Tech. in Mechanical Engineering with Specialization in Production and Industrial Engineering

SEMESTER	Courses (L-T-P) Credits							No. of Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Finite Element Methods (3-1-0) 4	Heat and Mass Transfer (3-1-0) 4	Instrumentation & Control (3-0-0) 3	Advanced Materials Engineering (3-0-0) 3	Production and Inventory Decisions (3-0-0) 3	Foreign Language (1-0-2) 2	CAD Lab (0-0-4) 2	**6**	**16**	**2**	**6**	**24**	**21**
II	Ergonomics of Manu-facturing (3-0-0) 3	Open Elective (3-0-0) 3	Computer Integrated Manufacturing Systems (3-0-0) 3	Department-al Elective-1 (3-0-0) 3	Department-al Elective-2 (3-0-0) 3	Technical Presentati-on (1-0-2) 2	Thermal-Lab (0-0-4) 2	**6**	**16**	**0**	**6**	**22**	**19**
III	Technical Seminar (0-0-2) 2	Project (0-0-4) 4	Dissertation-I (0-0-15) 8					**0**	**0**	**0**	**21**	**21**	**14**
IV	Dissertation (0-0-21) 12							**0**	**0**	**0**	**21**	**21**	**12**

Total Credits – 66

Core Subjects

1. Finite Element Methods
2. Heat and Mass Transfer
3. Instrumentation & Control
4. Advanced Materials Engineering

Specialization (Production and Industrial Engineering) Core Subjects

1. Production and Inventory Decision
2. Ergonomics of Manufacturing
3. Computer Integrated Manufacturing Systems

Departmental Electives (Any Two)

1. Industrial Robotics
2. Robust Design
3. Discrete System Simulation
4. Advanced Maintenance Management
5. Supply Chain Management
6. Quality Engineering

Open Electives

1. Tribology
2. Renewable Energy and Energy Management
3. Reliability Engineering

M.Tech.

in

Mechanical Engineering

with specialization in

Production and Industrial Engineering

SYLLABI

MME101: FINITE ELEMENT METHODS

LTP: 3-1-0 **Credits: 4**

UNIT 1: Approximate Solution Methods (8)

Ritz and Rayleigh Ritz methods, Method of weighed residuals, General concepts, Point collocation, Subdomain collocation, Least squares, Galerkin method.

UNIT 2: Finite Difference Method (8)

Characteristics and classification of PDE, Solution of elliptic, Hyperbolic & parabolic PDE using Finite Difference Method.

UNIT 3: Introduction to Finite Element Method (12)

Introduction to variational calculus, The differential of a function; Euler-Lagrange equation, Geometric & natural boundary conditions, Basic Concept of Finite Element Method, Principle of potential energy; 1D elements, Derivation of Stiffness and Mass matrices for a bar, A beam and A shaft, Comparison with Analytical results; Interpolation and Shape functions; Solution of static problems and case studies in stress analysis of Mechanical components; FEA using 2D and 3D elements; Plain strain and plain stress problems, FE using plates / shell elements.

UNIT 4: Isoparametric Elements and Analysis (4)

Isoparametric Elements.

UNIT 5: Importance of Finite Element Mesh (8)

Automatic meshing techniques; Case studies using FEM for Design of simple element geometries such as a tapered bar, A plate with a hole.

Laboratory Work:

Practice of the concept covered in Lecture. Use of software for Finite Element Analysis.

Reference Books:

1. Reddy, J. N., An Introduction to the Finite Element Method, McGraw Hill, 2001.
2. Bathe, K. J., Finite Element Procedures, PHI, 1996.
3. Chandrupatla, T. R. and Belgundu, A. D., Introduction to Finite Elements in Engineering, PHI, 1997.
4. Zienkiewicz, O. C., The Finite Element Method, McGraw Hill, 2002.
5. Huebner, K. H., Dewhirst, D. L., Smith, D. E. and Byrom, T. G., The Finite Element Methods for Engineers, John Wiley and Sons, 2000.
6. Buchman, G. R., Finite Element Analysis, Schaum's Outlines, McGraw Hill, 1995.
7. Jordan, C. Calculus of Finite Differences, American Mathematical Society, 1979.

MME102: HEAT AND MASS TRANSFER

LTP: 3-1-0 **Credits: 4**

UNIT 1: Conduction **(10)**

Review of the basic laws of conduction, convection and radiation. General heat conduction equation in different co-ordinates. One dimensional steady state conduction with variable. Thermal conductivity and with internal distributed heat sources, extended surfaces review, Tapered fins, design considerations. Two dimensional steady-state conduction, semi-infinite and finite flat plates and cylinders, graphical method, relaxation technique. Unsteady state conduction in solids with infinite thermal conductivity, infinite thick-solids, periodic variation, solutions using Grolber's and Heisfer's charts.

UNIT 2: Convection **(8)**

Hydrodynamic and thermal boundary layers, differential equations, momentum and energy and their solutions, heat transfer in turbulent flow, eddy heat diffusivity, Reynold's analogy between skin friction and heat transfer. Free convection, empirical correlations, regimes of boiling, Nucleate and film boiling.

UNIT 3: Heat Exchangers **(4)**

Introductions, effectiveness and number of transfer units, design of heat exchangers.

UNIT 4: Radiation **(8)**

Introduction, laws of radiation, heat exchange between black bodies and non-black bodies, shape factor algebra, Radiation shields, electrical net-work approach of radiation heat exchange.

UNIT 5: Mass Transfer **(6)**

Introduction, Fick's law, General equation of mass diffusion steady state, diffusion through a plain membrane, diffusion of water vapour through air, Mass transfer coefficient, convective mass transfer, boundary layer governing equations, momentum heat & mass transfer analogies, mass transfer correlations.

UNIT 6: Heat Pipe **(4)**

Introduction, Working of Heat pipe, Different types of Heat Pipe, Detail of Heat Pipe components, Advantages of Heat Pipe, Application of Heat Pipe, Performance of Heat Pipe, Limitation of Heat Pipe, Analysis and Design of Heat Pipe.

Reference Books:

1. Fundamentals of Engineering Heat & Mass Transfer by R. C. Sachdeva, New Age Publishers.
2. Heat Transfer by Holman.
3. Principles of Heat Transfer by Kreith, McGraw Hill.
4. Transport phenomena by Bird, John Wiley.

MME103: INSTRUMENTATION & CONTROL

LTP: 3-0-0 **Credits: 3**

UNIT 1: Measurements and Measurement Systems (6)

Introduction, significance of measurement, methods of measurement, primary secondary and tertiary measurements, mechanical electrical and electronics instruments, applications of measurement system, elements of a generalized measurement system and its functional elements, classifications of standards, primary, secondary and working standards.

UNIT 2: Instrumentation Characteristics (4)

Static and dynamic characteristics, first and second order systems response, classification & sources of error, loading facts, mechanical, electrical

UNIT 3: Analysis of Experimental Data (6)

Errors and uncertainties in experiments, role of statistics and variance types of data, presentation of the observations, criteria for rejecting data, specifying result of experiments, confidence level, uncertainty analysis, overall uncertainty, graphical analysis and curve fitting, theory of least squares, application in calibration, goodness of fit, significant figures and rounding off.

UNIT 4: Transducers (8)

General criteria for selection, strain gauge, rosettes; types, applications. Variable inductance transducers, capacitive, piezo-electric transducers, transducers. Advantages and limitations of digital transducers over analog transducers, digital encoding transducers, classification of encoders, construction of encoders, shaft encoder, optical encoder.

UNIT 5: Control Systems (6)

Introduction, types of control systems, performance analysis, mathematical modeling, block diagram representation, representation of systems or processes, comparison elements, transfer function, representation of temperature control systems, signal flow graphs.

UNIT 6: Types of Controllers (4)

Introduction, types of control action, hydraulic controllers, electronic controllers, controllers.

UNIT 7: Transient and Steady State Response (6)

Time domain representation, laplace transform representation, system with proportional control, proportional cum derivative control, proportional cum integral control, error constants.

Reference Books:

1. Instrumentation for Measurement in Engineering by S. Gupta
2. Theory and application of Automatic Controls by B.C. Nakra.
3. A course in Mechanical Measurement & Instrumentation by A.K. Sawhney, D.R Publisher.
4. Mechanical Measurement by Beckwith & Buck

MME104: ADVANCED MATERIALS ENGINEERING

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(8)**

Retrospective of materials science in Engineering; Classification and importance of materials; Traditional engineering materials, Modern engineering materials, Advanced materials, Biomaterials, Nano-materials, Future materials.

UNIT 2: Polymers **(10)**

Definitions and types of polymers, Synthesis, processing and fabrication of polymers, Behavior of polymers: Crystallization, melting, glass transition, anelasticity, mechanisms of deformation and strengthening; Applications in structural, electrical and functional domains.

UNIT 3: Ceramics **(8)**

Definitions and types of ceramics, Traditional and Advanced Ceramics, Synthesis, Processing and fabrication of ceramics. Fracture mechanics of structural ceramics, Applications in structural, electrical and functional domains.

UNIT 4: Composites **(10)**

Refresher of Miller indices for cubic and non-cubic systems, anisotropic elasticity; Definition of composites, Elastic behavior of composites; Types of matrices, reinforcement and interfaces; Types of composites: PMCs, MMCs, CMCs, IMCs, SMCs and Nano-composites; Applications in natural, biological, structural and functional systems.

UNIT 5: Case Studies **(4)**

Case studies of development of space materials, superconducting materials, biomaterials, nanomaterials and future materials.

Reference Books:

1. Callister's Materials Science and Engineering: Indian Adaptation (W/Cd), by R.Balasubramaniam, Wiley India.
2. Introduction to Polymers, Robert J. Young, Peter A. Lovell, CRC Press.
3. Introduction to Ceramics, W. David Kingery, H. K. Bowen, Donald R. Uhlmann, John Wiley & Sons.
4. Composite Materials: Science and Engineering, Krishan Kumar Chawla, Springer.
5. Biomaterials Science: An Introduction to Materials in Medicine, Buddy D. Ratner, Academic Press
6. Indicated Research Publication and Class Notes.

MPI101: PRODUCTION AND INVENTORY DECISIONS

LTP: 3-0-0 **Credits: 3**

UNIT 1: INTRODUCTION (8)

An Overview of production systems, Production management objectives, Manufacturing strategy, Technological innovations on Manufacturing, Corporate strategic choices, Management of Technology.

UNIT 2: FORECASTING (8)

The forecasting process, Time series forecasting models, Monitoring and controlling the forecasting system, multi-item forecasting, Casual models, Judgment methods.

UNIT 3: PLANNING ACTIVITIES (8)

Aggregate Planning Strategies and methods, the Master Production Schedule, Planning of material requirements - MRP, Manufacturing Resources Planning.

UNIT 4: CONTROL ACTIVITIES (8)

Capacity planning and control, Production Activity control, Just - in - time systems, Scheduling in Manufacturing, Theory of constraints and synchronous manufacturing.

UNIT 5: INVENTORY MANAGEMENT (8)

Basic Inventory systems, Inventory systems under risk, Distribution inventory management, Supply chain management.

Reference Books:

1. Lee J. Krajewski, Larry P. Ritaman," Operations Management ", Addison-Wesley, 2000.
2. Seetharama L. Narasimhan, Dennis W. McLeavy, Peter J .Billington," Production Planning and Inventory Control ", PHI
3. Monks J.G.,"Operations Management", John Wiley, 1999.

MPI108: ERGONOMICS OF MANUFACTURING

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(10)**

Interdisciplinary nature of ergonomics, modern ergonomics.

UNIT 2: Human Performance **(10)**

Information input and processing, factors affecting human performance, physical work load and energy expenditure, heat stress, manual lifting.

UNIT 3: Work Space Design **(10)**

Anthropometry, Work-space design for standing and seated workers, arrangement of components with in a physical space, Interpersonal aspect of work place design.

UNIT 4: Design of Equipment **(10)**

Ergonomic Factors to be considered, design of displays and controls, design for maintainability.

Reference Books:

1. Martin Helander, “A Guide to Ergonomics of Manufacturing,” TMH, 1996.
2. Bridger, R.S., "Introduction to Ergonomics ", McGraw Hill, 1995.
3. McCormick, J., “Human Factors in Engineering and Design, McGraw Hill, 1992.

MPI107: COMPUTER INTEGRATED MANUFACTURING SYSTEMS

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(10)**

Types of production - Functions - Automation strategies - Production economics - Costs in manufacturing - Break-even-analysis.

UNIT 2: Automated Flow Lines **(10)**

Transfer mechanism - Buffer storage - Analysis of transfer lines - Line unbalancing concept - Automated assembly systems.

UNIT 3: Numerical Control and Robotics **(10)**

NC-CNC - Part programming - DNC - Adaptive control - Robot anatomy - Specifications - End effectors - Sensors - Robot cell design - CAD/CAM.

UNIT 4: Automated Handling, Storage and Inspection **(10)**

Automated material handling systems - AS/RS - carousel storage - Automated inspection - Contact and non-contact methods.

Reference Books:

1. Mikell P.Groover, "Automation, Production Systems and Computer Integrated Manufacturing," PHI, 1995.
2. Weatherall, "Computer Intergrated Manufacturing: A Total Company Strategy," 2nd edition, 1995.
3. Ronald G. Askin, "Modeling and analysis of Manufacturing Systems," John Wiley & Sons, 1993.

MME013: INDUSTRIAL ROBOTICS

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction to Robotics **(6)**

Evolution of Robots and Robotics, Laws of Robotics, Progressive advancement in Robots, Robot anatomy, Human Arm Characteristics, Design and Control issue, Manipulation and Control, Programming Robots.

UNIT 2: Coordinate Frames, Mapping and Transforms **(3)**

Coordinate Frames, Description of objects in space, Transformation of Vectors, Inverting a homogeneous Transform, Fundamental Rotation matrices.

UNIT 3: Direct Kinematic Model **(6)**

Mechanical structure and notations, Kinematic modeling of the manipulator, Denavit-Hartenberg Notation, Manipulator Transformation Matrix. Manipulator workspace, solvability of Inverse kinematics model, solution techniques, closed form solution.

UNIT 4: Manipulator Differential Motion and Statics **(6)**

Linear and angular velocity of a rigid body, relationship between transformation matrix and angular velocity, manipulator Jacobian, Jacobian Inverse, Jacobian Singularities, Static Analysis.

UNIT 5: Dynamic Modeling **(4)**

Lagrangian Mechanics, Two Degree of Freedom manipulator-Dynamic Model, Lagrange-Euler formulation Newton-Euler formulation, Inverse Dynamics.

UNIT 6: Control of Manipulators **(6)**

Open and Close loop control, linear control schemes, linear second order SISO model of a manipulator joint. Joint Actuators, Computed Torque Control, force control of Robotics, Manipulators, Hybrid position/force control, Impedance Force/Torque Control.

UNIT 7: Robotic Sensors **(3)**

Sensors in Robotics, classification of Robotic sensors, kinds of sensors used in robotics- Acoustic sensors optic, Pneumatic, force/Torque sensors.

UNIT 8: Robot Applications **(6)**

Industrial Applications-Material Handling, Processing Applications, Assembly applications, inspection application, Principles for Robot application and application planning, Robert safety, Non-Industrial Application.

Reference Books:

1. Fundamental of Robotics, Robert J. Sehilling Prentice Hall of India.
2. Introduction to Robotics, Saeed B. Niku Pearson Education Asia.
3. Robot Modeling and Kinematics, Rachid Manseur, Luxmi Publications.
4. Introduction to Robotics, Mechanics and Control, Second Edition, John J Craig, Addison-Wesley, 1999.
5. Introduction to Robotics, Analysis, Systems and Applications, Saeed B Niku, Prentice Hall India, 2002.
6. Automation, Production Systems and Computer Integrated Manufacturing, Groover, Mikell. P., Prentice Hall.
7. Robot Dynamics and Control, Mark W. Spong & M. Vidyasagar, John Wiley & Sons, 1989.
8. Robotics Control, Sensing, Vision and Intelligence, K.S. Fu, R.C. Gonzales, C.S.G. Lee, McGraw Hill, 1987.

MPI110: ROBUST DESIGN

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(6)**

Planning of Experiments, terminology, Anova rationale, Basics of quality by design.

UNIT 2: Factorial Experiments **(15)**

Single factor and multi factor experiments, tests on means, EMS rules.

UNIT 3: Robust Design Process **(9)**

Comparison of classical and Taguchi's approach, variability due to noise factors, principle of robustization, classification of quality characteristics and parameters, objective functions in robust design, S/N ratios.

UNIT 4: Orthogonal Experiments **(10)**

Selection and application of orthogonal arrays for design, Conduct of experiments, collection of data and analysis of simple experiments, Modifying orthogonal arrays.

Reference Books:

1. Phillip J. Rose, Taguchi Techniques for Quality Engineering, Prentice Hall, 1989
2. D. C. Montgomery, Design and Analysis of Experiments, John Wiley & Sons, 1984
3. Nicolo Belavendram, Quality by Design: Taguchi Techniques for Industrial Experimentation, Prentice Hall, 1995

MME014: DISCRETE SYSTEM SIMULATION

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(8)**

Systems, modeling, general systems theory, Concept of simulation, Simulation as a decision making tool, types of simulation.

UNIT 2: Random Numbers **(8)**

Pseudo random numbers, methods of generating random variates, discrete and continuous distributions, testing of random numbers.

UNIT 3: Design of Simulation Experiments **(12)**

Problem formulation, data collection and reduction, time flow mechanism, key variables, logic flow chart, starting condition, run size, experimental design consideration, output analysis and interpretation validation.

UNIT 4: Case Studies/Mini Project **(12)**

Development of simulation models using simulation language studied for systems like queuing systems, Production systems, Inventory systems, maintenance and replacement systems, Investment analysis and network.

Reference Books:

1. Jerry Banks and John S. Carson, Barry L. Nelson, David M. Nicol, Discrete Event System Simulation, Prentice Hall India, 2000.
2. Shannon, R.E. Systems Simulation, The Art and Science, Prentice Hall, 1975.
3. Thomas J. Schriber, Simulation using GPSS, John Wiley, 1991.

MPI103: ADVANCED MAINTENANCE MANAGEMENT

LTP: 3-0-0 **Credits: 3**

UNIT 1: Maintenance Concept **(6)**

Maintenance objectives and functions - Tero Technology - Five Zero concept - Maintenance costs and budgets - Maintenance organisation.

UNIT 2: Failure Data Analysis **(8)**

MTBF, MTTF, useful life - Survival curves - repair time distribution - exponential, Poisson, normal, Weibull applications - Standby systems - Availability of repairable systems - Maintainability prediction - Design for maintainability.

UNIT 3: Maintenance Models **(9)**

Maintenance policies - imperfect maintenance - Concept of minimal repair - Statistical aids for PM and break-down maintenance - PM schedules: deviations on both sides of target values - PM schedules for functional characteristics and large scale system - replacement models - DOM, opportunistic maintenance - Inspection and repair.

UNIT 4: Maintenance Logistics **(9)**

Spare parts management - setting the order points - overall /optimum past availability - Life cycle costing - Maintenance planning and scheduling - FMEA,VEIN analysis. Human Management, Incentives, UMS - Maintenance manuals - Maintenance staffing: learning curves, queuing and simulation techniques.

UNIT 5: Advnced Techniques **(8)**

Condition monitoring: WDM, Vibration and corrosion monitoring - Signature analysis - MMIS - Expert systems – Reliability-centred maintenance (RCM) - Total productive maintenance (TPM): Philosophy and Implementation.

Reference Books:

1. Gopalakrishnan, P., Banerji, A.K. "Maintenance and spare parts management " ' Prentice Hall of India.
2. Edward Hartmann, "Maintenance Management " Productivity and Quality Publishing Pvt., Ltd.
3. Seiichi Nakagima, "Introduction to Total Productive Maintenance," Productivity Press (India) Pvt., Ltd.

MME015: SUPPLY CHAIN MANAGEMENT

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(10)**

Logistics - Concepts, Definitions, approaches, factors affecting logistics. Supply chain - basic tasks of the supply chain - the new corporate model.

UNIT 2: Supply Chain Management **(10)**

The new paradigm, the modular company, the network relations, supply process, Procurement process - distribution management.

UNIT 3: Evolution of Supply Chain Models **(10)**

Strategy and structure - factors of supply chain - Manufacturing stages, supply chain progress - model for competing through supply chain management - PLC Grid, supply chain redesign - Linking supply chain with customer.

UNIT 4: Supply Chain Activity Systems **(10)**

Structuring the SC, SC and new products, functional roles in SC, SC design frame-work., collaborative product commerce (CPC). MRP, ERP, Warehouse management system, product data management - cases.

Reference Books:

1. Scharj, P.B., Lasen,T.S., Managing the Global Supply Chain, Viva Books, New Delhi, 2000.
2. Ayers, J.B., Handbook of Supply Chain Management, The St. Lencie Press, 2000.
3. Nicolas, J.N., Competitive Manufacturing Management: Continuous Improvement, Lean Production, Customer focussed Quality, McGraw Hill, NY, 1998.
4. Steudel, H.J. and Desruelle, P., Manufacturing in the Ninetees: How to become a Mean , Lean and World Class Competitor, Van Nostrand Reinhold, NY, 1992.

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MPI104: QUALITY ENGINEERING

LTP: 3-0-0 **Credits: 3**

UNIT 1: Quality Concepts **(8)**

Quality objectives - Quality control - Quality Assurance - Quality systems, economics, Statistical tolerancing - Quality loss function.

UNIT 2: Statistical Process Control **(8)**

Process variability - Control charts for variables and attributes, Moving average control charts, multivarichart- Cumulative chart - demerit control chart - process capability studies.

UNIT 3: Acceptance Sampling **(8)**

Economics of sampling - Acceptance sampling by variables and attributes - Single, double and sequential plans - OC Curves - ATI, ASN, AOQL - Standard sampling tables.

UNIT 4: Design of Experiments **(8)**

Factorial experiments - fractional replication - Taguchi methods - Use of orthogonal arrays - Cases.

UNITS 5: Reliability And Quality Management **(8)**

Reliability prediction and testing,- Quality circles- Zero defects programmes-ISO 9000 and TQM- Total Quality organization

Reference Books:

1. Logothetis, N. Managing for total quality from Deming to Taguchi and SPC, PHI, 1997.
2. Fiegenbarum, A.V.Total Quality Control, McGraw Hill Inc., 1991.
3. Douglas, C.Montgomery, Introduction to Statistical quality control, Second Edition John Wiley & Sons, 1991.

OEM014: TRIBOLOGY

LTP: 3-0-0 **Credits: 3**

UNIT 1: Introduction **(6)**

Introduction to Tribology, and its historical background, Industrial importance, Factors influencing, Tribological phenomena.

UNIT 2: Engineering Surfaces-Properties and Measurement **(8)**

Engineering surfaces - surface characterization, computation of surface parameters. Surface measurement techniques, Apparent and real area of contact, Contact of engineering surfaces.

UNIT 3: Surface Contact **(4)**

Hertzian and Non-hertzian contact. Contact pressure and deformation in non-conformal contacts.

UNIT 4: Friction **(6)**

Genesis of friction, friction in contacting rough surfaces, sliding and rolling friction, Various laws and theory of friction. Stick slip friction behaviour, frictional heating and temperature rise. Friction measurement techniques.

UNIT 5: Wear **(8)**

Wear and wear types. Mechanisms of wear -Adhesive, abrasive, corrosive, erosion, fatigue, fretting, etc., wear of metals and non-metals. Wear models – asperity contact, constant and variable wear rate, geometrical influence in wear models, wear damage. Wear in various mechanical components, wear controlling techniques.

UNTI 6: Lubrication **(3)**

Introduction to lubrication. Lubrication regimes. Lubricants and their properties. Solid Lubricants.

UNIT 7: Nanotribology **(5)**

Introduction to micro and nano tribology. Measurement tools used in nanotribology: SFA, STM, AFM, microscale and nanoscale wear, Nanofabrication/ nanomachining, Nanohydrodynamics, Nanolubrication Tribological issues in MEMS

Reference Books:

1. “Engineering Tribology” by Prasanta Sahoo, PHI.
2. “Engineering Tribology” by Stachowiak & Batchelor, Elsevier.
3. “Nanotribology and Nanomechanics: An Introduction” by Bharat Bhushan, Springer.
4. “Nanotribology” by Hsu & Ying, Springer.

OEM015: RENEWABLE ENERGY & ENERGY MANAGEMENT

LTP: 3-0-0 **Credits: 3**

UNIT 1: Solar Energy **(6)**

The sun as a perennial source of energy, direct solar energy utilization; solar thermal applications – water heating systems, space heating and cooling of buildings, solar cooking, solar ponds, solar green houses, solar thermal electric systems; solar photovoltaic power generation; solar production of hydrogen.

UNIT 2: Energy from Oceans **(8)**

Wave energy generation – energy from waves; wave energy conversion devices; advantages and disadvantages of wave energy; Tidal energy – basic principles; tidal power generation systems; estimation of energy and power; advantages and limitations of tidal power generation; ocean thermal energy conversion (OTEC); methods of ocean thermal electric power generation.

UNIT 3: Wind Energy **(4)**

Basic principles of wind energy conversion; design of windmills; wind data and energy estimation; site selection considerations.

UNIT 4: Hydro Power **(6)**

Classification of small hydro power (SHP) stations; description of basic civil works design considerations; turbines and generators for SHP; advantages and limitations.

UNIT 5: Biomass and Bio-fuels **(4)**

Energy plantation; biogas generation; types of biogas plants; applications of biogas; energy from wastes.

UNIT 6: Geothermal Energy **(4)**

Origin and nature of geothermal energy; classification of geothermal resources; schematic of geothermal power plants; operational and environments problems.

UNIT 7: Energy Conservation Management **(8)**

The relevance of energy management profession; general principles of energy management and energy management planning; application of Pareto's model for energy management; obtaining management support; establishing energy data base; conducting energy audit; identifying, evaluating and implementing feasible energy conservation opportunities; energy audit report; monitoring, evaluating and following up energy saving measures/projects.

Reference Books:

1. 'Renewable Energy Resources', John W Twidell and Anthony D Weir, BSP Publications, 2006.
2. 'Renewable Energy – Power for sustainable future', Edited by Godfrey Boyle. Oxford University Press, 2011.
3. 'Renewable energy sources and their environmental impact', S.A.Abbasi and Naseema Abbasi. PHI, 2001.
4. 'Renewable and novel energy sources', S.L.Sah. M.I. Publications, 1995.

MPI111: RELIABILITY ENGINEERING

LTP: 3-0-0 **Credits: 3**

UNIT 1: Reliability Concept **(8)**

Reliability function - failure rate - Mean time between failures (MTBF), Mean time to failure (MTTF*), a priori* and *a posteriori* concept - mortality curve, useful life availability, maintainability - system effectiveness.

UNIT 2: Reliability Data Analysis **(8)**

Time to failure distributions - Exponential, Normal, Gamma, Weibull, ranking of data - probability plotting techniques - Hazard plotting.

UNIT 3: Reliability Prediction Models **(8)**

Series and parallel systems - RBD approach, Standby systems - m/n configuration, Application of Baye's theorem - cut and tie set method - Markov analysis, FTA - Limitations.

UNIT 4: Reliability Management **(8)**

Reliability testing - Reliability growth monitoring, Non parametric methods - Reliability and life cycle costs - Reliability allocation, Replacement model.

UNIT 5: Risk Assessment **(8)**

Definition and measurement of risk - risk analysis techniques, Risk reduction resources, industrial safety and risk assessment.

Reference Books:

1. Modarres, "Reliability and Risk analysis ", Mara Dekker Inc., 1993.
2. Smith C.O." Introduction to Reliability in Design ", McGraw Hill, London, 1976.
3. John Davidson, "The Reliability of Mechanical system ", Institution of Mechanical Engineers, London, 1988.

Annexure-XXIV-B of Agenda Item no. 6.23

Bachelor of Computer Applications

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of in Information Technology

School of Engineering and Technology

SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Department of in Information Technology	
School:	School of Engineering and Technology	
Name of the Course:	Bachelor of Computer Applications	
Duration:	Three years	
Total No. of Credits:	135	
Date of Meeting of BOS:	July 11, 2012	
Members of BOS:	1. Prof. A.K.Soni, HOD	Chairman
	2. Dr. P.S Grover, Ex-Professor, Delhi University	Ext. Member
	3. Dr. Viveka Kumar, Mathematics	Int. Member
	4. Mr. Ashok Sahoo, CSE	Int. Member
	5. Mr. Surendra Singh Chahar, CA	Int. Member
	6. Mr. Sandeep Singh, ECE	Int. Member
	7. Mr. Amit Kumar Upadhyay, IT	Int. Member
Date of Meeting of Faculty Board:	July 18,2012	
Status :	Approved by BOS and Faculty Board	

COURSE STRUCTURE

Bachelor of Computer Applications

SEMESTER	Courses (L-T-P) Credits						L. Courses	Contact Hr./ Week				Credits
								L	T	P	Total	
I	Discrete Structures-Basics (3-1-0) 4	Introduction to Computers (3-0-2) 4	Fundamentals of 'C' Programming (3-0-2) 4	Elementary Linear Algebra (3-1-0) 4	Information and Communication Technology (ICT) (3-0-2) 4		5	15	2	6	23	20
II	Advanced Course in 'C' programming (3-0-2) 4	Digital Electronics (3-1-2) 5	Introduction to Numerical Analysis (3-1-2) 5	Probability & Statistics (3-1-0) 4	Basics of Communication (3-0-0) 3		5	15	3	6	24	21
III	Database Management Systems-Basics (3-1-2) 5	Data Structures - Basics (3-1-2) 5	Principles of Operating Systems (3-1-2) 5	MATLAB (3-1-2) 5	Technical Presentation Skills (3-0-0) 3		5	15	4	8	27	23
IV	Computer Graphics - Basics (3-0-2) 4	Basics of Networking (3-1-2) 5	System Analysis & Design (3-0-0) 3	Basics of Object Oriented Programming (3-1-2) 5	Business Correspondence(3-0-0) 3	Basics of Differential Equations (3-1-0) 4	6	18	3	6	27	24
V	Computer Organization & Architecture (3-1-0) 4	.NET (3-1-2) 5	Software Engineering (3-1-0) 4	Mini Project (0-0-4) 2	Departmental Elective-1 (3-1-0) 4	Departmental Elective-2 (3-1-0) 4	6	15	5	6	26	23
VI	Internet & Java Programming (3-1-2) 5	Project (0-0-16) 8	Departmental Elective-3 (3-1-0) 4	Departmental Elective-4 (3-1-0) 4	Writing for Technical Purpose (3-0-0) 3		5	12	3	18	33	24
						Total :	**32**	**90**	**20**	**50**	**160**	**135**

Total Credits-135

LIST OF DEPARTMENTAL ELECTIVES

1. Basics of E-Commerce
2. Distributed Systems – Basics
3. Mobile Computing
4. Data Warehousing & Mining
5. Multimedia & Animation
6. Artificial Intelligence
7. Network Security & Cryptography
8. Client & Server Computing
9. Cloud Computing
10. ERP System
11. Software Testing
12. Soft Computing

LIST OF OPEN ELECTIVES

Nil

Bachelor of Computer Applications

SYLLABI

Discrete Structures – Basics (BCA 101)

L T P: 3-1-0 **Credit: 4**

UNIT 1: Mathematical Logic **(8)**
Introduction, Statements- Representation Of Statements, Connectives And Truth Table- Negation, Conjunction, Disjunction, Conditional And Bi-Conditional, Converse, Inverse And Contrapositive Implications.

UNIT 2: Tautologies **(10)**
Contradiction, Principle Of Substitution, Logical Equivalence, Arguments- Valid And Fallacy Arguments, Rules Of Inferences, Duality Law, More Connectives- Exclusive OR, NAND And NOR Connective, Prepositional Functions & Quantifiers, Normal Forms, Mathematical Induction, Predicate Calculus.

UNIT 3: Boolean Algebra **(8)**
Introduction Of Boolean Algebra, Properties Of Boolean Algebra, Basic Operations- Logical Addition, Product And Complementation, Sub-Boolean Algebra, Boolean Function, Minterms And Maxterms, Implementation Of Logic Expressions With Logic Gates And Switching Circuits, Arithmetic Circuits.

UNIT 4: Normal Forms **(8)**
Disjunctive Normal Form, Conjunctive Normal Form, Conversion Of CNF To DNF And Vice-Versa, Simplification Of Boolean Expression By Algebraic Method, Logic Gates, Minimization Of Boolean Function (Karnaugh Maps).

UNIT 5: Graph Theory **(6)**
Introduction, Graph, Types Of Graph- Finite, Infinite And Trivial Graph, Simple And Multigraph, Incidence And Degrees, Isolated And Pendent Vertex, Null Graph, Connected And Disconnected Graph, Complete Graph, Bipartite Graph Directed Graph.

Text Books:

1. Kenneth A. Ross, Discrete mathematics, PHI.
2. Liu C. Elements of Discrete Mathematics, McGraw Hill.

Reference Books:

1. Lepsie Seymour, Discrete Mathematics, Schaum's Outline Series.
2. Swapan Sarkar, Discrete Mathematics, S. Chand.
3. Biggs Norman L., Discrete Mathematics, 2/e, *Oxford.*

Introduction to Computers (BCA 102)

L T P: 3-0-0 **Credit: 3**

UNIT 1: Introduction Of Computers **(8)**
History Of Computer System, Generations Of Computer, Distributed Computer System, Parallel Of Computer System, Number System, Computer Hardware, Computer Software, Applications Of Information Technology: Computer In Business And Industry, Home, Education And Training, Science And Medicine.

UNIT 2: Storage Devices **(8)**
Input Devices, Output Devices, Description Of Memory Units, Main And Auxiliary Storage Devices,

UNIT 3: Operating System **(8)**
DOS, Unix/Linux, Windows 2000/XP.MS-Office: MS-Word, MS-Excel And Power-Point Presentation.

UNIT 4: Internet Basics **(8)**
Evaluation & Growth Of The Internet, Working Of The Internet, Hardware & Software Requirements, Major Features Of Internet, Email, World Wide Web, FTP Using The Internet.

UNIT 5: Computer Security **(8)**
Introduction, Definition, Cryptography, Digital Signature, Firewall, Security Awareness And Policies.

Text Books:
1. Sinha P.K., Computer Fundamentals, BPB.
2. D S Yadav, "Foundations Of IT", New Age, Delhi.

Reference Books:
1. James K.L., The Internet: A User's Guide, *PHI.*
2. Rajaraman V., Fundamental Of Computers, 4/E, *PHI.*
3.Peter Nortans "Introduction To Computers", TMH.

Fundamentals of 'C' programming (BCA-103)

L T P: 3-0-0 **Credit: 3**

UNIT 1: Programming Fundamentals (6)
Flow Chart: Elements Of Flowchart, Symbols Used In Flow Chart, Design Of Flowcharts For Various Problems.
Algorithms: Definition, Characteristics, Uses And Development Of Algorithm.
Pseudo Code: Definition And Use And Various Control Statements.

UNIT 2: Basics Of C (8)
History Of C, Constant And Variable, Types Of Constants And Variables, Keywords, Data Types, Types Of Operators, Arithmetic Instructions, Logical Operators, Conditional Operators And Relational Operators, Hierarchy Of Operators In C ,Control Instructions, I/O Statements In C.

UNIT 3: Conditional Program Execution (10)
If And If-Else, Nesting If And Else, Else-If, Switch Statements, Restrictions On Switch Values, Use Of Break And Default With Switch.
Program Loops And Iteration: Uses Of While, Do-While And For Loops, Nested Loop, Break And Continue Statement.

UNIT 4: Arrays (10)
Define Array, Declaration, Initialization And Array Manipulation, Types Of Array: One Dimensional, Two Dimensional And Multi Dimensional Array.

UNIT 5: Strings (6)
Define String**,** Initializing Of Strings, Assigning Values To Strings, String I/O; Converting Strings To Other Types, String Manipulation Library Functions.

Text Books:
1. Kanetkar, Yashvant, Let Us C, 4/E, *BPB Publications*.
2. Balagurusamy, E Programming In ANSI C 2/E, *TMH*.

Reference Books:
1. Complete Reference 'C', Herbert Schildt, BPB Publications.
2. A Book On C, Era Pohl And Kelly, Pearson Education.

ICT (Information and Communications Technology) (BCA-105)

L T P: 3-1-0 **Credit: 4**

Unit1: Computer Skills **(7)**

Email, File Formats, Word Processing : Basic Editing, Formatting, Templates, Working With Graphics And Pictures, Tables, Desktop Publishing, Long Documents, Technical Documents, Mail Merge, Proofing, Printing, And Publishing, Comparing, Merging, And Protecting, Document, Customizing And Expanding Word.

Unit2: Using the Application (Spreadsheet) **(10)**

Introduction Of Spreadsheet & Its Applications, Worksheets And Workbooks, Entering Information, Formatting A Worksheet, Adding Elements To A Workbook, Charts, Formulas And Calculations, Forms, Tables, Developing A Workbook, Sharing Worksheets And Workbooks.

Unit3 : Creating Presentations **(8)**

Getting Started, Creating, Saving, Closing & Opening A Presentation, Using Themes And Layouts, Inserting Text And Using Word-Art, Inserting Graphics (Tables, Charts, Shapes, Clip-Art), Working With Videos, Movie-Clips, Animations, And Transitions, Sounds, Reviewing And Adding Comments To The Presentation, Printing.

Unit4: ICT Tools in the Classroom **(8)**

ICT Usage And Tools, Internet Search Techniques, Evaluating Websites, Social Bookmarking, Planning And Implementing Internet-Based Classes, Voice, Video & Text Chat, Blogs, RSS, Wikis, Online Reference Tools. Web 2.0, M-Learning, Electronic Portfolios. Commercial ICT Courseware, Assessment.

Unit-5 : ICT Class Project **(7)**

ICT Class Project: Planning, Implementation, Review, Reflection.

Text Books :

1. David W. Beskeen, Carol Cram, Jennifer Duffy, Lisa Friedrichsen, Elizabeth Eisner; Microsoft Office 2010: Illustrated Introductory, First Course, Microsoft Corporation.

Reference Books :

1. Katherine Murray, Microsoft Office 2010 Plain & Simple, Microsoft Corporation.

Advanced Course in 'C' Programming (CMP-102)

L T P: 3-0-0 **Credit: 3**

UNIT 1: Pointers **(8)**
Introduction, Declaration Of Pointer Variables, Operations On Pointers, Arrays Of Pointers, Structure Pointers, Dynamic Memory Allocation.

UNIT 2: Structures **(8)**
Introduction, Declaration, Initialization, Complete Structure Assignment, Nested Structures, Self Referential Structures, User Defined Data Type, Unions – Definition, Declaration, Accessing Union Elements.

UNIT 3: Functions **(8)**
Introduction, Function Definition And Prototyping, Calling A Function, Types Of Functions, Parameter Passing In Functions, Recursion, Passing Structures To Functions, Storage Class Specifiers.

UNIT 4: C Preprocessor **(8)**
Types Of C Preprocessor Directives, # And ## Preprocessor Operators, Macros, Conditional Compilation Directives, Pre Defined Macro Names, Comments.

UNIT 5: File Handling In C **(8)**
File Concepts And Organization, Files In C, Files And Streams, Working With Files Using Stream I/O, Sequential And Direct File Organization.

Text Books:
1. Balagurusamy, E Programming In ANSI C 2nd Edition. Tata Mcgraw – Hill.
2. Kanetkar, Yashavant, Pointer With C, BPB Publications.

Reference Books:
1. Complete Reference 'C', Herbert Schildt, BPB Publications.
2. A Book On C, Era Pohl And Kelly, Pearson Education.
3. Dennis Ritchie " C Programming" Prentice Hall India Limited.

Digital Electronics (BCA 104)

L T P: 3-1-0 **Credit: 4**

Unit 1: Introduction **(8)**
Introduction To Data And Signals, 1's And 2's Complement, Binary Arithmetic Codes, Logic Gates, Demorgan's Law, Boolean Algebra, Minimization Using Karnaugh Map, Nand And Nor Gate Implementation.

Unit 2: Combinational Circuits **(8)**
Adder, Subtractor, Encoder, Decoder, Multiplexer, Demultiplexer, Bcd To Seven Segment Decoder, 4-Bit Magnitude Comparator.

Unit 3: Sequential Circuits-I **(8)**
SR FF, Clocked SR FF, D FF, JK FF, T FF, Master-Slave FF.

Unit 4: Sequential Circuits- Ii **(8)**
Registers:- Shift Registers, Universal Registers , Bidirectional Register
Counters: Synchronous Counters, Mod-K Counter, Bcd Counter, Ring Counters, The Johnson Counter, Counter Applications.

Unit 5: Memories **(8)**
Memory Hierarchy, ROM, RAM, PLA & PAL.

Text Books:
1. M. Morris Mano: *Digital Design*. Third Edition, Prentice Hall.
2. Malvino And Leach, Digital Principlecs And Applications, Tmh.

Reference Books:
1. John F. Wakerley, Digital Design Principles And Practices, Third Edition Updated, Pearson Education Singapore, 2002.
2. R.L.Tokheim, "Digital Electronics, Principles And Applications", Tata Mcgraw Hill, 1999.
3. S Salivahanan,S Arivazhagan, *Digital Circuits And Design*, Second Edition, Vikas Publications.
4. J. S Katre, Switching Theory, Third Edition, Tech-Max Publication.

Annexure-XXIV-B of Agenda Item no. 6.23

Master of Computer Applications

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Information Technology
School of Engineering and Technology

SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Information Technology	
School:	School of Engineering and Technology	
Name of the Course:	Master of Computer Applications	
Duration:	Three years	
Total No. of Credits:	135	
Date of Meeting of BOS:	July 11, 2012	
Members of BOS:	1. Prof. A.K.Soni, HOD	Chairman
	2. Dr. P.S Grover, Ex-Professor, Delhi University	Ext. Member
	3. Dr. Viveka Kumar, Mathematics	Int. Member
	4. Mr. Ashok Sahoo, CSE	Int. Member
	5. Mr. Surendra Singh Chahar, IT	Int. Member
	6. Mr. Sandeep Singh, ECE	Int. Member
	7. Mr. Amit Kumar Upadhyay, IT	Int. Member
Date of Meeting of Faculty Board:	July 18,2012	
Status :	Approved by BOS and Faculty Board	

COURSE STRUCTURE

Master of Computer Applications

SEMESTER	Courses (L-T-P) Credits						L. Courses	Contact Hr./ Week				Credits
								L	T	P	Total	
I	Computer System Architecture (3-0-2) 4	Problem Solving & programming in 'C' (3-1-2) 5	Linear Algebra (3-1-0) 4	Boolean Algebra & Graph Theory (3-1-0) 4	Professional Communication (3-0-0) 3		5	15	3	4	22	20
II	Database Management System (3-0-2) 4	Principles of Operating Systems (3-0-0) 3	Data Structures (3-1-2) 5	Numerical Analysis (3-1-2) 5	MATLAB (3-1-2) 5		5	15	3	8	26	22
III	Object Oriented Programming Using Java (3-1-2) 5	Unix & Shell Programming (3-1-2) 5	Software Engineering (3-1-0) 4	Human Resource Management (3-0-0) 3	PREPS-1 (3-0-0) 3	Operations Research (3-1-0) 4	6	18	4	4	26	24
IV	Web Technology (3-1-2) 5	Computer Networks (3-1-2) 5	Design & Analysis of Algorithms (3-1-2) 5	PREPS-2 (3-0-0) 3	DE-1 (3-1-0) 4	DE-2 (3-1-0) 4	6	18	5	6	29	26
V	.NET Framework & C# Programming (3-0-2) 4	Computer Graphics - Basics (3-1-2) 5	Quality Management (3-0-0) 3	Mini Project (0-0-8) 4	DE-3 (3-1-0) 4	DE-4 (3-1-0) 4	6	15	3	12	30	24
VI	Seminar (4-0-0) 4	Project (0-0-30) 15					2	4	0	30	34	19
						Total :	**30**	**85**	**18**	**64**	**167**	**135**

Total Credits - 135

LIST OF DEPARTMENTAL ELECTIVES

1. Software Testing & Quality Assurance
2. Data Mining & Warehousing
3. Mobile Operating Systems
4. Compiler Construction
5. Fundamentals of ERP System
6. Cloud Computing
7. Theory of Computation
8. Introduction to Soft Computing
9. Distributed Operating Systems
10. Data & Network Security
11. Software Project Management
12. Advanced Computer Networks

LIST OF OPEN ELECTIVES

Nil

Master of Computer Applications

SYLLABI

MCA-109: Computer System Architecture

L T P : 3-0-0 **Credit: 3**

UNIT 1: Introduction **(10)**

Computer Arithmetic: Addition and subtraction of signed numbers, Conversion of numbers, Multiplication: Signed operand multiplication, Booths algorithm and array multiplier.
Digital computer: Functional units and their interconnections, Buses, Bus architecture, Types of buses and bus arbitration, Bus and memory transfer.

UNIT 2: Central Processing Unit **(8)**

General register organization, Stack organization and addressing modes. Instruction types, Formats, and instruction, Cycles: Fetch and execute etc, Micro-operations, Execution of a complete instruction, Hardwired and Micro-programmed control.

UNIT 3: Processor Design **(6)**

Processor organization: General register organization, Stack organization and addressing modes, Instruction format, Data transfer and manipulation, ALU Design, Program Control, Reduced Instruction Set Computer (RISC).

UNIT 4: Memory Organization **(8)**

Basic concepts of memory organization, RAM memories and types, ROM memories and types. Concept and design issues of Cache memory: Performance, Address mapping and replacement, Virtual memory.

UNIT 5: I/O Organization **(8)**

Peripheral devices, I/O interface, I/O ports, Interrupts: Interrupt hardware, Types of interrupts
Modes of Data Transfer: Programmed I/O, and Direct Memory Access.

Text Book:

1. Mano, " Computer System Architecture", PHI

Reference Books

1. Patterson, Computer Organization and Design, Elsevier Pub. 2009
2. William Stalling, " Computer Organization", PHI
3. John P Hays, " Computer Organization", McGraw Hill
4. Tannenbaum, " Structured Computer Organization", PHI

MCA-112: Problem Solving & Programming in 'C'

L T P : 3-1-0 **Credit: 4**

UNIT 1: Fundamentals of C **(10)**

Flowchart, Algorithm and Pseudocode, Elements of C: History, Introduction to C programming language, Structure of a C program, Compilation and Execution of C program, Data types, Variables, modifiers, Identifiers and keywords, Symbolic constants, Storage classes, Operators and Expressions, Comments, Control statements and loops.

UNIT 2: Arrays and String **(8)**

Arrays: One dimensional and multi dimensional array, Declaration, Initialization and Array manipulation, Array as parameters.

Strings: Initializing of strings, Assigning values to strings, Converting strings to other types,Library functions for manipulation.

UNIT 3: Pointers and Function **(8)**

Pointers: Pointers & addresses, Pointers & arrays, Pointers & function arguments, Address arithmetic, Character pointers and functions, Pointers to pointer,Array of pointers.

Functions: Built-in and user-defined, Function declaration, Definition and function call. Parameter passing: Call by value, Call by reference, Recursive functions and Macro functions.

UNIT 4: Structures and unions **(8)**

Definition, Initializing, Assigning values, Passing of structures as arguments, Arrays of structure, Pointers to structures, Unions.

UNIT 5: C Preprocessor and File Handling **(6)**

C preprocessor, macros, Conditional compilation directives, Pre defined macro names.

File handling: Operation on a data file, Creating a data file, I/O operations on files, Sequential and direct file organization.

Text Books:

1. Byron S Gottfried, Programming with 'C' Schaum's Outline.
2. Balagurusamy, E programming in ANSI C 2/e, TMH

Reference Books:

1. "Complete Reference 'C'", Herbert Schildt, BPB Publications.
2. "A book on C", Era Pohl and Kelly, Pearson Education.

MCA-108: Boolean Algebra & Graph Theory

L T P : 3-1-0 **Credit: 4**

UNIT 1: Boolean algebra & Logic circuits **(8)**

Boolean algebra & Logic circuits: Definition, Basic operations, Axioms and theorems of Boolean algebra, Boolean functions, D'Morgan's Theorem, Sum-of-Products, Product-of-Sums form, Logic gates, Digital circuits, Implementation of logic expressions with logic gates and switching circuits, Karnaugh maps, Arithmetic circuits

UNIT 2: Introduction to Graphs **(8)**

Introduction to Graphs & Sub graphs, Basic properties, Various operations on graphs, Walks, Path & circuits, Euler graphs, Various operation on graphs, Hamiltonian paths & circuits, Travelling salesman problem.

UNIT 3: Tree **(8)**

Trees, center(s), Diameter, Radius in a tree, Binary trees and their properties, Spanning trees, Fundamental circuits, Finding all spanning trees of a graph and a weighted graph, Cuts sets and their basic properties, Fundamental circuits and cut sets, Connectivity and separability.

UNIT 4: Matrix Representation of Graphs **(8)**

Matrix representations of a graph, Incidence matrix, Circuit matrix, Cut set matrix, Path matrix and their properties, Relationships among A_f, B_f, and C_f, adjacency matrices.
Coloring graphs, Chromatic number, Chromatic polynomials, Five color theorem.

UNIT 5: Directed Graphs **(8)**

Directed graphs, Some types of directed graphs, Directed paths and connectedness, Euler digraphs, trees with directed edges, Fundamental circuits in digraphs, Matrices A, B and C of digraphs, Adjacency matrix of a digraph

Text Books:

1. Kenneth A. Ross, Discrete mathematics, PHI
2. Deo Narsingh, Graph Theory,PHI
3. Liu C. Elements of Discrete Mathematics, McGraw Hill

Reference Books:

1. Lepsie Seymour, Discrete Mathematics, Schaum's Outline Series
2. Swapan Sarkar, Discrete Mathematics, S. Chand
3. Harary, F, Graph Theory, Narosa

MCA-111: Database Management System

L T P : 3-0-0 **Credit: 3**

UNIT 1: Introduction (10)

Data base system concepts and architecture, Data models schema and instances, Data independence and data base language and interface, Data definition languages, DML. Overall data base structure

Data modeling using Entity Relationship Model: E.R. model concept, Notation for ER diagrams mapping constraints, Keys, Concept of super key, candidate key, Primary key generalizations, Aggregation, Reducing ER diagrams to tables, Extended ER model, Relationships of higher degree.

UNIT 2: Relational Data Model and Language (8)

Relational data model concepts, Integrity constraints ,Keys domain constraints, Referential integrity, Assertions triggers, Foreign key relational algebra, Relational calculus, Domain and tuple calculus, SQL data definition queries and Updates in SQL.

UNIT 3: Data Base Design (8)

Functional dependencies, Normal forms, First, Second and Third functional personal normal forms. BCNF, multi-valued dependencies Fourth normal forms, Join dependencies and Fifth normal forms. Inclusion dependencies, Loss less join decompositions, Normalization using FD, MVD and JDs, Alternatives approaches to database design.

UNIT 4: Transaction processing & Concurrency Control (8)

Transaction processing system, Schedule and recoverability, Testing of serializability, Serializability of schedules, Conflict & View serializable schedule ,Transaction processing in distributed database fragmentation, Locking.

Concurrency Control Techniques: Locking Techniques for concurrency control, Time stamping protocols for Concurrency control, Validation technique, Multiple granularities, Multiversion schemes.

UNIT 5: DBMS Web (6)

Requirements for web- DBMS integration, Web-DBMS architecture, Advantages and Disadvantages of web-DBMS approach, Approaches to integrating the web and DBMS.

Text Books:

1. Korth , Silbertz, Sudarshan, ”Data base concepts”, McGraw-Hill
2. Elmasri, Navathe, ”Fundamentals of Database systems”, Addision Wisley

Reference Books:

1. Date C.J., ”An Introduction to Database systems”, Addison-Wesley Publishing Company
2. Ramakrishna, Gehkre, ”Database Management System”, McGraw-Hill
3. Alexion leon,” Fundamental of database Management Systems”, Vikas
4. George Schlossnagel, “dvanced PHP Programming” Developers Library, Sam's Publishing.

CMP-203: Principles of Operating Systems

L T P : 3-0-0 **Credit: 3**

UNIT 1: Introduction **(6)**

Operating System and Function, Evolution of Operating System, Batch, Interactive, Time Sharing and Real Time System.

Operating System Structure: System Components, System Structure, Operating System Services.

UNIT 2: Concurrent Processes **(10)**

Process Concept, Principle of Concurrency, Producer / Consumer Problem, Critical Section, Problem, Semaphores, Classical Problems in Concurrency, Inter Processes Communication, Process Generation, Process Scheduling.

CPU Scheduling: Scheduling Concept, Performance Criteria Scheduling Algorithm, Evolution, Multiprocessor Scheduling.

UNIT 3: Deadlock **(12)**

System Model, Deadlock Characterization, Prevention, Avoidance and Detection, Recovery from Deadlock, Combined Approach.

Memory Management: Basic Machine, Resident Monitor, Multiprogramming with Fixed Partition, Multiprogramming With Variable Partition, Multiple Base Register, Paging, Segmentation, Paged Segmentation, Virtual Memory Concept, Demand Paging, Performance, Paged Replaced Algorithm, Allocation of Frames, Thrashing, Cache Memory Organization, Impact on Performance.

UNIT 4: I/O Management & Disk Scheduling **(6)**

I/O Devices and the Organization of I/O Function, I/O Buffering, Disk I/O, Disk Scheduling.

UNIT 5: File System **(6)**

File System: File Concept, File Organization and Access Mechanism, Directory Structure, File Sharing, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management.

Text Books:

1. Milenekovic, "Operating System Concept", McGraw Hill.
2. Silveschatz, Peterson J, "Operating System Concepts", Willey.

Reference Books:

1. W. Stalling, "Operating System", Maxwell Macmillan
2. Dietal, "An Introduction to Operating System", Addision Wesley.
3. Petersons, "Operating Systems", Addision Wesley.
4. Tannenbaum, "Operating System Design and Implementation", PHI.

MCA-110: Data Structures

L T P : 3-1-0 **Credit: 4**

UNIT 1: Introduction to Data Structures (5)

Definition of data structures and abstract data types, Static and Dynamic implementations. Examples and real life applications, Fundamentals of algorithm analysis Big 'O' notations, Time and Space complexity of an algorithm Data Structures: Arrays, Address calculation in a single and multi dimensional array. Sparse matrices

UNIT 2: Stacks (6)

Definition, Array based implementation of stacks, Linked List based implementation of stacks, Examples: Infix, Postfix, Prefix representation, Applications: Mathematical expression Evaluation, Backtracking, Tower of Hanoi.

UNIT 3: Queues and Lists (8)

Definition, Array based implementation of Queues, Linked List based implementation of Queues, Operations on Queues, Circular Queue, Deque, Priority Queue.

Definition of Linked List, Operations on Linked List, Singly Linked List, Doubly Linked list, Circular Linked List, Doubly Circular Linked List

UNIT 4: Trees & Graphs (11)

Definition of trees and Binary trees, Properties of Binary trees and Implementation, Binary Traversal - preorder, post order, in order traversal, Binary Search Trees, Implementations, Threaded trees, Balanced multi way search trees, AVL Trees, Implementations, Applications

Definition of Undirected and Directed Graphs and Networks, The Array based implementation of graphs, Adjacency matrix, path matrix implementation, The Linked List representation of graphs, Shortest path Algorithm, Graph Traversal, Spanning Tree, Minimum Cost Spanning Tree

UNIT 5: Sorting and Searching Algorithms (10)

Introduction, Sorting by exchange, selection, insertions, Bubble sort, Selection sort, Insertion sort, Pseudo code algorithm and their C implementation, Efficiency of above algorithms, Shell sort, Performance of shell sort, Merge sort, Merging of sorted arrays.

Analysis of Quick sort, Picking a Pivot, A partitioning strategy, Heap sort, Heap Construction, Heap sort, bottom – up, Top – down Heap sort approach, Radix sort. Straight Sequential Search, Array implementations, Linked List representations, Binary Search, Recursive & Non Recursive Algorithms.

Text Books:

1. Y. Langsam, M. Augenstin and A. Tannenbaum, "Data Structures using C and C++", Pearson Education Asia, 2nd Edition, 2002.
2. E. Horowitz , S.Sahani, S.Anderson-Freed "Fundamentals of Data Structures in C", Universities Press .

Reference Books:

1. J.Tremblay, P. Soresan, "An introduction to data structures with Applications", 2nd edition, Tata McGraw-Hill International Editions, 1984.
2. S. Lipschutz, Data Structures Mc-Graw Hill International Editions, 1986.
3. Brian W.Kernigham and Pike R., "The Practice of Programming",Addison Wesley, 1999.
4. Kruse R.L., Tondo C.L. and Leung B.P, "Data Structures and Program Design in C", Prentice Hall, 1997.

MCA-113: MATLAB

L T P : 3-1-0 **Credit: 4**

Unit 1: Introduction **(10)**

Introduction to Matlab, Matlab Commands, Interactive Computation, Programming in MATLAB,M-files Scripts and Function, Applications, Graphics, Comparison with C.

Unit 2: Algorithms in Numerical methods **(10)**

Matlab applied to the following numerical method: Bisection method, Newton-Raphson method, Trapezoidal and Simpson's rule, Curve fitting.

Unit 3: **Project work** **(20)**

Text Books:

1. Pratap R, "Getting Started with MATLAB 7: A Quick Introduction for Scientists and Engineers", Oxford University Press, 2005
2. ConteS.D.,"Elementary Numerical Analysis: An Algorithmic Approach"

Reference Book:

1. William Palm III, "A Concise introduction to MATLAB", McGraw-Hill.

Annexure-XXIV-B of Agenda Item no. 6.23

M.Sc.

in

Biotechnology

COURSE STRUCTURE & SYLLABI

(with effect from academic session 2012-13)

Department of Biotechnology
School of Engineering and Technology
SHARDA UNIVERSITY

SUMMARY SHEET

Department:	Biotechnology	
School:	School of Engineering and Technology	
Name of the Course:	MSc in Biotechnology	
Duration:	Two Years	
Total number of Credits:	66	
Date of Meeting of BOS:	July 12, 2012	
Members of BOS:	1. Dr. Simendra Singh, HOD	Chairman
	2. Dr. V. K. Baranwal, IARI, New Delhi	Ext. Member
	3. Dr. V. K. Tiwari	Ext. Member
	4. Dr. Pankaj Kishor Mishra, Asstt. Professor	Int. Member
	5. Mrs. Rashmi Pandita, Asstt. Professor	Int. member
	6. Mrs. Monika Jain, Asstt. Professor	Int. Member
Date of Meeting of Faculty Board:	July 18, 2012	
Status:	Approved by BOS and Faculty Board	

COURSE STRUCTURE

M.Sc. in Biotechnology

SEMESTER	Courses (L-T-P)							Lecture Courses	Contact Hr/Week				Credits
									L	T	P	Total	
I	Biophysics and Biochemistry (3-1-0) 4	Advanced Molecular Biology (3-1-0) 4	Advanced Genetic Engineering (3-0-0) 3	Environmental Biotechnology (3-0-0) 3	Bioinstruments (3-0-0) 3	Foreign Language (1-0-2) 2	Practical (0-0-4) 2	6	16	2	6	24	21
II	Immunology and Immunotechnology (3-0-0) 3	Drug Discovery and Development (3-0-0) 3	Advances in Metabolic and Enzyme Engineering / Fermentation Technology (3-0-0) 3	Advances in Plant Biotechnology / Animal Cell Technology (3-0-0) 3	Open Elective (3-0-0) 3	Technical Communication (1-0-2) 2	Practical (0-0-4) 2	6	16	0	6	22	19
III	Seminar (0-0-2) 2	Project (0-0-4) 4	Dissertation (0-0-15) 8					0	0	0	21	21	14
IV	Dissertation (0-0-21) 12							0	0	0	21	21	12

Total Credits- 66

LIST OF DEPARTMENTAL ELECTIVES

1. Metabolic and Enzyme Engineering
2. Fermentation Technology
3. Advanced Plant Biotechnology
4. Animal Cell Technology

LIST OF OPEN ELECTIVES

Nil

M.Sc.

in

Biotechnology

SYLLABI

MSB 109: Biophysics and Biochemistry

L T P: 3-1-0 **Credit: 4**

Unit I: Carbohydrates, Lipids and Amino acids (10)

Carbohydrate: classification and structure; Polysaccharides, glycoprotein and peptidoglycans; Amino acids: classification, structure and properties; Lipids: classification and structure.

Unit II: Metabolic Pathways (10)

Glycolysis and TCA cycle; Photosynthesis, Photo-phosphorylation, Photorespiration and Oxidative phosphorylation; Glycogen Metabolism; Fatty acid metabolism.

Unit III: Chemistry of Biomolecules (10)

Protein-ligand interactions; Modulation of protein interactions by chemical energy; Protein sequencing; Biosynthesis of purine and pyrimidines; Transformations of nucleotides and nucleic acids.

Unit IV: Principles of Enzyme Catalysis (10)

Classification of enzymes; Enzyme activity; Effect of pH and temperature; Types of Inhibition; Michaelis-Menten Kinetics; Immobilized enzymes; Industrial enzymes.

Reference Books:

1. Nelson D.L. and Cox M.M., “Lehninger Principles of Biochemistry”, W.H. Freeman, 2009.
2. Wilson K. and Walker J., “Principles and Techniques of Biochemistry and Molecular Biology”, Cambridge University Press, 2005.
3. Belk C. and Borden V.M., “Biology: Science for Life with Mybiology”, Benjamin Cummings, 2010.

MSB 111: Advanced Molecular Biology

L T P: 3-1-0 **Credit: 4**

Unit I: Genome Organization (10)

Structure of eukaryotic chromosomes; Heterochromatin and Euchromatin; Structure of DNA; DNA reassociation kinetics (Cot curve analysis); Repetitive and unique sequences; Satellite DNA; DNA melting and buoyant density; DNA methylation and Imprinting.

Unit II: Replication (8)

Replication initiation, elongation and termination in prokaryotes and eukaryotes; Enzymes and accessory proteins; Fidelity; Replication of single stranded circular DNA.

Unit III: Prokaryotic and Eukaryotic Transcription (12)

Prokaryotic Transcription; Transcription unit; Promoters: Constitutive and Inducible; Operators; Regulatory elements; Initiation, attenuation and termination.

Eukaryotic transcription and regulation; RNA polymerase structure and assembly; RNA polymerases; Eukaryotic promoters and enhancers; TATA binding proteins (TBP) and TBP associated factors (TAF); Activators and repressors.

Unit IV: Post-transcriptional Modifications and Translation (10)

Post-transcriptional modifications: 5'-Cap formation; 3'-end processing and polyadenylation; Translation machinery; Ribosomes; Composition and assembly; Universal genetic code; Degeneracy of codons; Termination codons; Wobble hypothesis; Mechanism of initiation, elongation and termination.

Reference Books:

1. Lewin B., “Gene IX”, Jones and Barlett Publishers, 2007.
2. Watson J.D., Hopkins N.H., Roberts J.W., Seitz J.A. and Weiner A.M., “Molecular Biology of the Gene”, Benjamin Cummings Publishing Company Inc, 2007.
3. Alberts B., Johnson A., Lewis J. and Raff M., “Molecular Biology of the Cell”, Garland Science, 2002.

MSB 110: Advanced Genetic Engineering

L T P: 3-0-0 **Credit: 3**

Unit I: Enzymes and Cloning Vectors (12)

Enzymes

Enzymes involved in manipulation of genetic material; DNA polymerase; Polynucleotide kinase; T4 DNA ligase; Nick translation system; Terminal deoxynucleotidy1 transferase; Reverse transcriptase; Restriction endonucleases Type I and II.

Vectors

Plasmids and bacteriophages; Cosmids; Phagemids; ssDNA Phages; Yeast cloning vectors; Shuttle vectors; Animal viruses as vectors; Expression vectors; Ti plasmids; Binary vectors; Artificial chromosomes (YAC, BAC).

Unit II: Nucleic acid Isolation, Amplification and its Applications (8)

Isolation and purification of DNA and RNA; Polymerase Chain Reaction and its types; Detection of target DNA; Labeling of nucleic acids; Labeling techniques; Nick translation; End labeling; Primer extension; Random priming methods; Concept and use of linkers and adapters.

Unit III: Cloning and Expression (12)

PCR product cloning (TA cloning); Construction of recombinant DNA; Transformation; Transfection; cDNA synthesis strategies: Linkers, Adapters, Homopolymer tailing; cDNA libraries; Selection methods of rDNA clones; Recombinant selection and screening of Genomic and cDNA library; DNA hybridization, colony hybridization and in-situ hybridization; Expression of recombinant protein.

Unit IV: Application of Recombinant DNA Technology (8)

Gene transfer in animal and plant cells; Applications of Genetic Engineering; Generations of novel plants and animals; Mutagenesis; Site directed mutagenesis; Diagnostics of genetic expressions; Protein engineering.

Reference Books:

1. Brown T.A, “Gene Cloning and DNA Analysis: An Introduction”, John Wiley & Sons, 2010.
2. Old R.W and Primrose S.B., “Principles of Gene Manipulation”, Blackwell Scientific Publication, 2002.
3. Dale W., von Schantz M. and Plant N., “From Genes to Genomes: Concepts and Applications of DNA Technology”, John Wiley, 2011.

MSB 112: Environmental Biotechnology

L T P: 3-0-0 **Credit: 3**

Unit I: Pollution **(10)**

Sources of pollution; Air and water as a source of natural resource; Oil pollution; Surfactants; Pesticides; Measurement of pollution; Water pollution; Biofilm; Soil pollution; Radioactive pollution; Ozone depletion; Green house effect; Impact of pollutants; Pollution of milk and aquatic animals.

Unit II: Remediation and Management **(12)**

Bioaugmentation; Bioremediation of contaminated soils and waste lands; Bioremediation of contaminated ground water; Macrophytes in water treatment; Phytoremediation of soil metals; Bioremediation of organic pollutants and odorous compounds; Use of bacteria, fungi, plants, enzymes, and GE organisms.

Unit III: Alternate Sources of Energy **(10)**

Biomass as source of energy; Rural biotechnology; Biocomposting; Biofertilizers; Vermiculture; Organic farming; Bio-mineralization; Biofuels; Bioethanol and biohydrogen.

Unit IV Environment and Health **(8)**

Gene and environment; Effect of carbon and other nanoparticles upon health; Gene mutation; Genetic testing; Genetic sensors; Environmental pollution and children; Human biomonitoring.

Reference Books:

1. Evans G.G and Furlong J. “Environmental Biotechnology: Theory and Application”, Wiley, 2011.
2. Fulekar M.H, “Environmental Biotechnology”, Science Pub, 2010.
3. Miller G.T. and Spoolman S., “Environmental Science”, Brooks Cole, 2010.

MSB 107: Bioinstruments

L T P: 3-0-0 **Credit: 3**

Unit I: Electrophoresis **(8)**

Gel electrophoresis; Southern, Northern and Western blotting; Capillary electrophoresis; Immunoelectrophoresis; Isoelectric focusing; Two-dimensional gel electrophoresis.

Unit II: Chromatography **(8)**

Thin layer chromatography; Column chromatography; Ion-exchange chromatography; Gel filtration and permeation; Affinity chromatography; High performance liquid chromatography.

Unit III: Microscopy and Cell/Tissue Culture Techniques **(12)**

Optical and Electron microscope; Atomic Force Microscopy; Fluorescence microscopy; Cell disruption techniques; Ultracentrifugation; Flow Cytometry; Magnetic-activated cell sorting.

Unit IV: Spectrometry and Spectroscopy **(12)**

Mass spectrometry; Nuclear Magnetic Resonance; Spectrophotometer; ELISA reader; Absorption and fluorescence spectroscopy; Atomic spectroscopy; Circular Dichroism; Raman Spectroscopy; X-Ray crystallography.

Reference Books:

1. Wilson K. and Walker J., “Principles and Techniques of Biochemistry and Molecular Biology”, Cambridge University Press, 2010.
2. Ninfa A.J., Ballou D.P. and Benore M., “Fundamental Laboratory Approaches for Biochemistry and Biotechnology”, Wiley, 2009.
3. Sheehan D., “Physical Biochemistry: Principles and Applications”, Wiley, 2009.

MBB 002: Immunology and Immunotechnology

L T P: 3-0-0 **Credit: 3**

Unit I: Introduction to Immune System **(10)**

An overview of Immunology; First, second and third line of defense; Components of cell-mediated and humoral immunity; Components of innate and acquired immunity; Phagocytosis; Complement and inflammatory responses; Haematopoesis; Maturation of different immune cells; Organ and cells of the immune system-primary and secondary lymphoid organ.

Unit II: Nature and Biology of Antigen and Super-antigen **(10)**

Antigen-antibody reaction; Diagnostic procedure; Structure and function of immunoglobulins; Organization and expression of Ig genes; Immunoglobulin and T-cell receptor genes; Major histocompatibility complex; Complement system; Antigen processing and presentation, BCR and TCR.

Unit III: Regulation of Immune Response **(10)**

Generation of humoral cell and cell mediated immune responses; Activation of B and T- lymphocytes; Cytokines and their role in immune regulation; Immunological tolerances; Genetic control of immune responses; Cell-mediated cytotoxicity; Antibody-dependent cell mediated cytotoxicity; Macrophage-mediated cytotoxicity; Effector mechanism.

Unit IV: Immunotechnology **(10)**

Immunoprophylactic intervention; Active and passive immunization; Types of vaccines; Hypersensitivity; Autoimmunity, Tumor immunology, AIDS and other immunodeficiencies; RIA, ELISA: principle of serological assays and types of ELISA; Hybridoma technology and monoclonal antibodies; Catalytic antibodies and generation of immunoglobulin gene libraries.

Reference Books:

1. Kindt T.J., Osborne B.A. and Goldsby R.A., “Kuby Immunology”, W. H. Freeman, 2006.
2. Delves P.J, Martin S.J., Burton D.R. and Roitt I.M., “Roitt’s Essential Immunology”, Wiley, 2011.
3. Paul B.W.E, “Fundamental Immunology”, Lippincott Williams and Wilkins, 2008.

MSB 113: Drug Discovery and Development

L T P: 3-0-0 **Credit: 3**

Unit I: Steps of Drug Discovery (10)

Pharmaceuticals of animal, plant and microbial origin; Cell- and target-based assays; Systematic screening; High throughput screening; Rational drug design; Molecular basis of drug action; Multiphore conceptualization of drugs; Messenger and non-messenger target systems.

Unit II: Drug Development Process (10)

Drug evaluation using animal models; Pre-clinical trials; Clinical trials; Role of regulatory authorities: IND, FDA Medical Device Regulation; Medicine regulation in India; Clinical Trial Regulation- IND, EU Directives; GLP.

Unit III: Principles of Pharmacology (10)

Mechanism of drug absorption, distribution, metabolism and excretion; Factors affecting the ADME process; Bioequivalence; Pharmacokinetics; Pharmacodynamics; Risk assessment; Therapeutic response; Route of drug administration.

Unit IV: Drug Target Identification and Validation (10)

Target identification strategies (Gene knockout and knockin, RNA interference, Protein inhibition, Biomarker profiling, DNA microarray); Personalized medicine (scientific and commercial aspects).

Reference Books:

1. Zhang L. and Demain A.L., “Natural Products: Drug Discovery and Therapeutic Medicine”, Humana Press, 2010.
2. Liljefors T., Krogsgaard-Larsen P. and Madsen U., “Textbook of Drug Design and Discovery”, Taylor and Francis, 2002.
3. Ng R., “Drugs: From Discovery to Approval”, Wiley-Blackwell, 2008.

MSB103: Advances in Metabolic and Enzyme Engineering

L T P: 3-0-0 **Credit: 3**

Unit I: Metabolic Engineering: Current Trends (10)

Metabolic control analysis: Flux control coefficient, Summation theorem, Elasticity coefficient, Connectivity theorem, Response coefficient, Control of carbon flux, Stoichiometric analysis and the optimization of phenylalanine production.

Unit II: Applications of Metabolic Engineering (10)

Metabolic engineering of *Escherichia coli, Klebsiella oxytoca, Zymomonas mobilis, Saccharomyces cerevisiae, Pichia stipitis, Pichia pastoris*.

Unit III: Enzyme Engineering and Applications (10)

Target enzymes and desired modifications of physical parameters of enzymes, specialty enzymes, hydrolytic enzymes; Methods of enzyme engineering (traditional and recent innovation): Site-directed mutagenesis, Cassette mutagenesis, Random "directed-evolution" mutagenesis, Mutagenesis based on tertiary and crystallographic 3D-structures.

Unit IV: Modification of Enzymes and Co-factor Engineering (10)

Modification of enzymes for *in vivo* biosynthetic processes, NADH versus NADPH specificity of enzymes, *In vivo* manipulation of NADH level, *In vivo* Manipulation of acetyl CoA level for improved esters formation.

Reference Books:

1. El-Mansi E.M.T. and Stephanopoulos G., "Fermentation Microbiology and Biotechnology", CRC Taylor and Francis, 2011.
2. Najafpour G.D., "Biochemical Engineering and Biotechnology", Elsevier, 2006.
3. Nielsen J., "Metabolic Engineering", Springer, 2010.

MSB 002: Fermentation Technology

L T P: 3-0-0 **Credit: 3**

Unit I: Introduction to Fermentation Process (10)

Microbial growth kinetics; Media for Industrial fermentation; Design of industrial nutrient media; Sterilization: Thermal death kinetics of microorganisms; Batch and continuous; Heat sterilization of liquid media; Filter sterilization of liquid media and air.

Unit II: Bioreactors (10)

Physiology of immobilised cells; Packed bed biorecators; Fluidized-bed bioreactors; Air lift bioreactors; Bubble column bioreactors; Immmobilized enzymes bioreactors; Integrated systems of bioreaction and bioseparation.

Unit III: Bioreactor Instrumentation and Control (12)

Measurement of physical and chemical parameters in bioreactors; Monitoring and control of dissolved oxygen, pH, impeller speed and temperature in stirred tank fermenter; Transport Phenomenon in Bioreactor: Oxygen demand, solubility, measurement of DOT; Agitation and mixing; Effect of stirring, sparging and other parameters; Power requirements for gassed and ungassed system; Rheology; Oxygen transfer.

Unit IV: Plant and Animal Cell Bioreactors (8)

Characteristics of plant cell suspensions; Plant cell bioreactor: design, requirements and operation; Alternative cultures for plant cells; Animal cells; Animal cell bioreactors: design and operation.

Reference Books:

1. Doran P.M., “Bioprocess Engineering Principles”, Academic Press, 2012.
2. McNeil B. and Harvey L., “Practical Fermentation Technology”, Wiley, 2008.
3. Katoh S. and Yoshida F., “Biochemical Engineering”, Wiley-VCH, 2009.

MBB 101: Advances in Plant Biotechnology

L T P: 3-0-0 **Credit: 3**

Unit I: Genetic Engineering of Plants (10)

Production of transgenic plants for fungal, bacterial and viral disease resistance; Herbicide resistance; Drought and other abiotic stress resistance; Quality parameters: Modification of nitrogen fixing capabilities; Gene pyramiding

Unit II: Indirect Gene Transfer (10)

Structural features of Ti and Ri plasmids; Mechanism of gene transfer to plants; Integration of T-DNA into plant genome; Molecular events in Agrobacterium-mediated gene transfer. Applications and limitations of Agrobacterium gene transfer; Opines and their significance.

Unit III: Direct Gene Transfer (10)

Cointegrate and binary vectors and their utility; Direct gene transfer; PEG-mediated; Electroporation; Particle bombardment; Silicon carbide fiber mediated transformation; Screenable and seletable markers; Characterization of transgenics: Chloroplast transformation; Marker-free methodologies; Gene targeting.

Unit IV: Applications of Plant Biotechnology (10)

Embryo rescue and embryo culture; Endosperm culture and production of seedless plants; Production of plants through tissue culture; AFLP-Variety identification and fingerprinting; Molecular farming; Use of bioreactors in plant production; Plantibodies; Edible Vaccines; Production of pharmaceutically important compounds; Environmental safety, handling and regulatory issues.

Reference Books:

1. Altman A. and Hasegawa P.M., “Plant Biotechnology and Agriculture”, Academic Press, 2011.
2. Chrispeels M.J. and Sadava D.E., “Plants, Genes and Crop Biotechnology”, Jones and Bartlett Publishers, 2011.
3. Slater A., Scott N.W. and Fowler M.R., “Plant Biotechnology: The Genetic manipulation of Plants”, Oxford University Press, 2008.

MBB 001: Animal Cell Technology

L T P: 3-0-0 **Credit: 3**

Unit I: Cell Culture **(10)**

Culture media and culture procedure; Aseptic culture techniques; Development and maintenance of cell lines; Monolayer adherent culture and suspension cell culture; Culture media and growth conditions; Role of CO_2, serum and supplements; Tissue disaggregation and primary culture; Growth kinetics.

Unit II: Cell Characteristics **(10)**

Measurement of viability and cytotoxicity; Growth characteristics and kinetics; Preservation methods; Contact inhibition; Anchorage (in)dependence; Cell-cell communication; Cell senescence; Somatic Cell Genetics.

Unit III: Scale-up and Animal Organ Culture **(10)**

Cell synchronization; Cell cloning and micromanipulation; Cell transformation; Scaling-up of cell cultures; Micro-carrier attached growth; Cell culture in continuous, perfusion and hollow fibre reactor; Organ and histotypic cultures; Three dimensional culture; Tissue Engineering.

Unit IV: Applications of Animal Biotechnology **(10)**

Hybridoma technology; Cell culture based vaccines; Stem cell therapy; Genetic counselling; Transgenic animals: Construction and applications; DNA fingerprinting; Autoantibody fingerprinting; Toxicological, handling and regulatory issues.

Reference Books:

1. Freshney R.I., “Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications”, Wiley-Blackwell, 2010.
2. Pörtner R., “Animal Cell Biotechnology: Methods and Protocols”, Humana Press, 2007.
3. Castilho L., Moraes A., Augusto E. and Butler M., “Animal Cell technology: From Biopharmaceuticals to Gene Therapy”, Taylor & Francis, 2008.

Annexure-XXV of item no. 6.24

SHARDA UNIVERSITY

School of Business Studies

Rules, Regulations and Guidelines of Examinations for BBA and B.Com. (Professional) Programs

1. ACADEMIC SESSION

Academic of SBS is credit based system.

The academic session will normally begin in the first week of August and end in the last week of May. There will be six semesters/terms for the programs.

Summer Training in industry shall be from 1st June to 30th July after second year.

Each term shall consist of four months. The End Term Examination (ETE) shall be during the month of December and May for odd and even term, respectively.

2. REGISTRATION

a. Registration is a very important procedural part. All students are required to register in person for each Term for the courses to be pursued by them on the dates specified in the Academic Calendar of SBS.

b. Failure to register will debar the student from appearing in ETE.

c. The student will be required to clear all dues at the time of registration. Students will also be required to submit all the necessary documents & certificates at the time of registration.

d. Registrar may accept documents after the registration, in exceptional cases but not later than 15 days prior to commencement of End-Term Examination.

3. ATTENDANCE REQUIREMENT

a. In order to be eligible to appear in the ETE, the average attendance of a student in a Term must be 75%.

b. The attendance shall be counted from the date of commencement of classes or date of registration, whichever may be later.

c. In case, the student's average attendance in below 75%, the case will be referred to a Committee appointed by the Vice Chancellor to consider relaxation in attendance up-to

a maximum of 10% on all counts and on valid reasons to be submitted in writing (i.e. medical, natural calamities and unforeseen circumstances in the family).

4. ASSESSMENT/ EVALUATION PROCEDURE

The evaluation is a continuous process and is based on performance in different examinations/tests as detailed below:

a. Theory Courses

Theory courses will be assessed through continuous assessment and End term Examination.

i. Continuous Assessment (CA)

CA will consist of continuous class assessment and class tests, and will carry 50% weightage as below:

- Continuous class assessment carrying 30% weightage. It is a continuous process and will be based on students' performance in: 1. Class participation & Attendance 2. Presentations 3. Group presentations 4. Quizzes 5. Assignment work 6. Case studies.

- Class test carrying 20% weightage.
  Two class tests (10 marks each) for each paper to be conducted by the concerned faculty.

ii. End Term Examination (ETE)

End-Term Examination (ETE) carrying 50% weightage.
The End-Term Examination shall be conducted by the Controller of Examination, Sharda University. Program is faculty led and the papers will be set by the faculty concerned. Moderation will be done by the Moderation Committee appointed by the Vice Chancellor of the University on the recommendation of COE. Moderation Committee will consist of internal and external experts.

b. Summer Training Report and Viva-Voce:

(i) Summer Training of eight weeks is an integral part of BBA and B.Com.(Professional) Programs.

(ii) Each student will have to make a presentation of the work done by him/her during summer training and appear before experts for viva-voce at the end of Term-IV for BBA and B.Com.(Professional) programs.

(iii) Out of the total 100 Marks, 40% weightage will be given by the faculty and industry mentors and 60% weightage will be given by the Viva-Voce Committee for the report & Viva-Voce examination.

(iv) The Viva-Voce Committee will consist of one external examiner, one faculty mentor and one internal expert as decided by the Controller of Examination on recommendation of Dean of the School.

c. Project Work

i. Each student of the BBA and B.Com.(Professional) Programs will have to undertake a guided project work for fulfillment of program requirement under the supervision of the faculty guide.

ii. The topic will be decided by the faculty guide in consultation with the student keeping in view his area of specialization, with approval of Dean.

iii. The project report will be submitted and evaluated by a Viva-Voce Committee [as in (b) (iv)] in Term-VI for BBA and B.Com.(Professional) programs.

iv. Out of the total 100 Marks, 40% weightage will be given by internal faculty guide and 60% weightage will be given by the Viva-Voce Committee for the report & Viva-Voce examination.

d. Backlog Courses

A student may accumulate backlog papers to the maximum extent of six in one academic year consisting of two semesters. If a student accumulates a backlog of more than 6 papers, he will be required to leave the program.

e. Re-Sit Examination

A student will be allowed to appear in a Re-Sit Examination for clearing the backlogs towards the end of that Academic Year. The Re-Sit Examination will be only for ETE papers.

5. GRADING SYSTEM

Grading system shall be in accordance with Sharda University norms except for the following.

a. A student will be awarded a letter grade in each of the courses in which he/she is registered depending upon the weighted total marks he/ she obtains in the CA and end term examination (ETE) of evaluation as defined in the Course detail. A student will have to pass CA and ETE with a minimum of 40% marks and 50% in aggregate.

b. The student obtaining less than 40% marks in CA will not be allowed to appear in the ETE of the concerned paper in that term. Once the student has cleared CA, he/she can appear in the ETE along with re-sit examination.

c. The students failing in CA will have to attend classes as and when offered by the school and those failing in sixth Term, will have to repeat the paper when offered.

Note: For make-up in Continuous Assessment

A student who has been absent from any Class Test/ Assignment/ Presentation/ Mid-Term, etc. due to any genuine reason (i.e. medical, natural calamities and unforeseen circumstances in the family) only shall be given chance for any make-up in continuous assessment. Further, only those students, whose applications are approved by a Committee appointed by the Vice Chancellor, will be allowed to make-up continuous assessment of the above.

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FRENCH & GERMAN

Course Structure & Syllabi
(With effect from academic session 2012-2013)

School of Languages & Culture
Sharda University

SUMMARY SHEET

Department:	Electronics and Communication
School:	School of Languages & Culture (SOL)
Name of the Course:	Certificate course in French/ German
Duration:	2 Semesters
Total No. of Credits:	4
Date of meeting of BOS:	July 24th, 2012
Members of BOS:	1. Prof James: Chairperson 2. Prof Rashid, First Secretary for Education & Culture. Embassy of Afghanistan (Ext. Member) 3. Ms. Gunjan Sharma, Language Expert, Japan Foundation (Ext. Member) 4. Dr. Shweta Singh, Prof (English) Amity University (Ext. Member) 5. Ms. Kavita Iyer faculty, SOL(Int. Member)
Date of Meeting of the Faculty Board:	July 25th, 2012
Status:	Approved by Board of Studies

FRENCH - I

Credits: 2
No. of lectures per week: 1
No. of lab sessions per week: 2

Course Objective:
To familiarize the students with the French language
- with the phonetic system
- with the syntax
- with the manners
- with the cultural aspects

Course Contents:

Module A: pp. 01 to 37: Unités 1, 2, Unité 3 Object if 1, 2 **(4)**
Only grammar of Unité 3: object if 3, 4 and 5

Contenu lexical: Unité 1: Découvrir la langue française: (oral et écrit) **(4)**
1. se présenter, présenter quelqu'un, faire la connaissance des autres, formules de politesse, rencontres
2. dire/interroger si on comprend
3. Nommer les choses

Unité 2: Faire connaissance **(4)**
1. donner/demander des informations sur une personne, premiers contacts, exprimer ses goûts et ses préférences
2. Parler de soi: parler du travail, de ses activités, de son pays, de sa ville.

Unité 3: Organiser son temps **(4)**
1**.** dire la date et l'heure

Contenu grammatical: **(4)**
1. organisation générale de la grammaire
2. article indéfini, défini, co
3. nom, adjectif, masculin, féminin, singulier et
4. négation avec « de », "moi aussi", "moi non plu
5. interrogation: Inversion, est-ce que, qui, que, quoi, qu'est-ce que, où, quand, comment, quel(s), quelle(s) Interro-négatif: réponses: oui, si, n
6. pronom tonique/disjoint- pour insister après une préposition
7. futur proche

Examination Scheme:

Components	**CT1**	**CT2**	**C**	**I**	**V**	**A**
Weightage (%)	20	20	20	20	15	5

C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:
- le livre à suivre : Campus: Tome 1

FRENCH - II

Credit Units: 02

Course Objective:
To enable the students to overcome the fear of speaking a foreign language and master spoken French.
To make them learn the basic rules of French Grammar.

Course Contents:

Module A: pp.38 – 47: Unité 3: Object if 3, 4, 5. 6 **(4)**

Module B: pp. 47 to 75 Unité 4, 5 **(4)**

Contenu lexical: **Unité 3: Organiser son temps** **(2)**

1. donner/demander des informations sur un emploi du temps, un horaire SNCF – Imaginer un dialogue
2. rédiger un message/ une lettre pour …
   i) prendre un rendez-vous/ accepter et confirmer/ annuler
   ii) inviter/accepter/refuser
3. Faire un programme d'activités
   imaginer une conversation téléphonique/un dialogue
   Propositions- interroger, répondre

Unité 4: Découvrir son environnement **(2)**

1. situer un lieu
2. s'orienter, s'informer sur un itinéraire.
3. Chercher, décrire un logement
4. connaître les rythmes de la vie

Unité 5: s'informer **(4)**

1. demander/donner des informations sur un emploi du temps passé.
2. donner une explication, exprimer le doute ou la certitude.
3. découvrir les relations entre les mots
4. savoir s'informer

Contenu grammatical:

1. Adjectifs demonstratives **(4)**
2. Adjectifs possessifs/exprimer la possession à l'aide de :
   i. « de » ii. A+nom/pronom disjoint
3. Conjugaison pronominale – négative, interrogative - construction à l'infinitif
4. Impératif/exprimer l'obligation/l'interdiction à l'aide de « il faut…. »/ «il ne faut pas… »
5. passé composé
6. Questions directes/indirectes

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

- le livre à suivre : Campus: Tome 1

GERMAN - I

Credits: 2
No. of lectures per week: 1
No. of lab sessions per week: 2

Course Objective:
To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany

Course Contents:

Module I: Introduction (2)
Self introduction: heissen, kommen, wohnwn, lernen, arbeiten, trinken, etc.
All personal pronouns in relation to the verbs taught so far.
Greetings: Guten Morgen!, Guten Tag!, Guten Abend!, Gute Nacht!, Danke sehr!, Danke!, Vielen Dank!, (es tut mir Leid!),
Hallo, wie geht's?: Danke gut!, sehr gut!, prima!, ausgezeichnet!,
Es geht!, nicht so gut!, so la la!, miserabel!

Module II: Interviewspiel (2)
To assimilate the vocabulary learnt so far and to apply the words and phrases in short dialogues in an interview – game for self introduction.

Module III: Phonetics (4)
Sound system of the language with special stress on Dipthongs

Module IV: Countries, nationalities and their languages (2)
To make the students acquainted with the most widely used country names, their nationalitie and the language spoken in that country.

Module V: Articles (2)
The definite and indefinite articles in masculine, feminine and neuter gender. All Vegetables, Fruits, Animals, Furniture, Eatables, modes of Transport

Module VI: Professions (2)
To acquaint the students with professions in both the genders with the help of the verb "sein".

Module VII: Pronouns (2)
Simple possessive pronouns, the use of my, your, etc.
The family members, family Tree with the help of the verb "to have"

Module VIII: Colours (1)
All the color and color related vocabulary – colored, colorful, colorless, pale, light, dark, etc.

Module IX: Numbers and calculations – verb "kosten" (1)
The counting, plural structures and simple calculation like addition, subtraction, multiplication and division to test the knowledge of numbers.
"Wie viel kostet das?"

Module X: Revision list of Question pronouns **(1)**
W – Questions like who, what, where, when, which, how, how many, how much, etc.

Examination Scheme:

Components	**CT1**	**CT2**	**C**	**I**	**V**	**A**
Weightage (%)	20	20	20	20	15	5

C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch
- Schulz Griesbach, Deutsche Sprachlehre für Ausländer
- P.L Aneja, Deutsch Interessant- 1, 2 & 3
- Rosa-Maria Dallapiazza et al, Tangram Aktuell A1/1, 2
- Braun, Nieder, Schmöe, Deutsch als Fremdsprache 1A, Grundkurs

GERMAN – II

Credit Units: 02

Course Objective:

To enable the students to converse, read and write in the language with the help of the basic rules of grammar, which will later help them to strengthen their language.
To give the students an insight into the culture, geography, political situation and economic opportunities available in Germany
Introduction to Grammar to consolidate the language base learnt in Semester I

Course Contents:

Module I: Everything about Time and Time periods **(2)**
Time and times of the day.
Weekdays, months, seasons.
Adverbs of time and time related prepositions

Module II: Irregular verbs **(2)**
Introduction to irregular verbs like to be, and others, to learn the conjugations of the same, (fahren, essen, lessen, schlafen, sprechen und ähnliche).

Module III: Separable verbs **(2)**
To comprehend the change in meaning that the verbs undergo when used as such
Treatment of such verbs with separable prefixes

Module IV: Reading and comprehension **(2)**
Reading and deciphering railway schedules/school time table
Usage of separable verbs in the above context

Module V: Accusative case **(2)**
Accusative case with the relevant articles
Introduction to 2 different kinds of sentences – Nominative and Accusative

Module VI: Accusative personal pronouns **(2)**
Nominative and accusative in comparison
Emphasizing on the universal applicability of the pronouns to both persons and objects

Module VII: Accusative prepositions **(4)**
Accusative propositions with their use
Both theoretical and figurative use

Module VIII: Dialogues **(4)**
Dialogue reading: 'In the market place'
'At the Hotel'

Examination Scheme:

Components	CT1	CT2	C	I	V	A
Weightage (%)	20	20	20	20	15	5

C – Project +Presentation
I – Interaction/Conversation Practice

Text & References:

- Wolfgang Hieber, Lernziel Deutsch
- Hans-Heinrich Wangler, Sprachkurs Deutsch

ENGLISH BRIDGE COURSE (International students)

Course objective:

To equip students to face the linguistic challenges in a different atmosphere
Help students to understand different accents and standardise their existing English
Guide the students to hone the basic communication skills, listening, speaking reading and writing.

Module 1
Listening Skills

- Everyday Business Communication
- Communicating Internationally
- Listening comprehension, summarizing & paraphrasing
- Cross cultural communication

Module 2
Speaking Skills

- Communicating with people from diverse backgrounds, understanding different accents and cultural aspects
- Tellephone ettiquetttes, netiquettes
- Meetings (how to conduct meetings)
- Presentations & Conferences
- Interviews, group discussions
- Pronunciation drills & vocabulary practice

Module 3
Writing Skills

- Grammar refresher: subject- verb agreement, avoiding common errors
- Vocabulary building for Business writing
- Writing for specific purposes
- Structure and organisation of a written text
- Writing effectively
- Written Business communication, inter office conversation

Module 4
Practical

- Reading comprehension
- Picture description
- Movie review
- Book review
- Basic translations .(Translating a native poem or a short story into English)
- Role playing

Sharda University

School of Languages&Culture

Bachelor of Arts (English Honours)

Programme Code:

Duration – 3 Years Full Time

Program Structure

And

Curriculum & Scheme of Examination

2012

Program Structure

Semester I

Course Code	Course Title	Lecture (L) Hrs per week	Tutorial (T) Hrs per week	Practical	Total Credits
	History of English Literature	5	1	-	6
	English Poetry from Chaucer to Blake	5	1	-	6
	Drama from Elizabethan to Restoration Age	5	1	-	6
	Economics- I Psychology-I	1	1	-	2+2
	Total				22

Semester II

Course Code	Course Title	Lecture (L) Hrs per week	Tutorial (T) Hrs per week	Practical	Total Credits
	History of English Language	5	1	-	6
	English Poetry from Wordsworth to Tennyson	5	1	-	6
	Modern Drama	5	1	-	6
	Economics- II Psychology-II	1	1	-	2+2
	Total				22

Semester III

Course Code	Course Title	Lecture (L) Hrs p/w	Tutorial (T) Hrs p/w	Practical	Total Credits
	20th Century Indian English Poetry	5	1	-	6
	English Novel	5	1	-	6
	Literary Criticism	5	1	-	6
	Economics- III Psychology-III	1	1	-	2+2
	Total				22

Semester IV

Course Code	Course Title	Lecture (L) Hrs per week	Tutorial (T) Hrs per week	Practical	Total Credits
	20th Century Indian English Novel	5	1	-	6
	Prose Down the Ages	5	1	-	6
	Literary Theory	5	1	-	6
	Economics- IV Psychology-IV	1	1	-	2+2
	Total				22

Semester V

Course Code	Course Title	Lecture (L) Hrs p/w	Tutorial (T) Hrs p/w	Practical	Total Credits
	Modern English Poetry	5	1	-	6
	Contemporary Literature	5	1	-	6
	Popular Fiction	5	1	-	6
	Economics- V Psychology-V	1	1	-	2+2
	Total				22

Semester VI

Course Code	Course Title	Lecture (L) Hrs p/w	Tutorial (T) Hrs p/w	Practical	Total Credits
	Modern English Novel	5	1	-	6
	American Literature	5	1	-	6
	Introduction to Linguistics/ Modern European Drama	5	1	-	6
	Dissertation			-	7
	Total				25

Curriculum & Scheme of Examination

HISTORY OF ENGLISH LITERATURE

Course Code: **Credit Units: 06**

Course Objective:

The course is designed to give a broad background of English Literature over a period of some 14 centuries to the students. This will give the students an insight into the major literary canons – that sequence of interlinked works - with their characteristic trends and genres with major literary authors and texts. This course explores the long history of writing in the British Isles, from the Anglo-Saxon and the early Christian period and the world over in the present day. It gives a record of English writing – poetry, drama and fiction in the various regions.

Course Contents:

Module I
Middle English (Morality plays, Miracle plays)

Module II
Renaissance (Elizabethan – Poetry, Theatre; Jacobean – Revenge plays, Metaphysical Poets; Caroline - Cavalier poets; Puritan Age)

Module III
Classical Age (Restoration – Drama, Satire, Religious Writings; Augustan Age)

Module IV
Romanticism

Module V
Victorian Age

Module VI
Modernism in English Literature.

Module VII
Emergence and Development of New Literatures in English.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Harry Blamires. 1984. A Short History of English Literature Second Edition. London. Rutledge
- David Daiches. 1979. History of English Literature, Vol. I, II, III.Allied Publishers.
- Jesse Matz. 2004. The Modern Novel: A Short Introduction. Wiley-Blackwell.
- Krishna, Arvind. An Illustrated History of Indian Literature In English. Orient Black Swan.
- Sanders, Andrew. Short Oxford History of English Literature. OxfordUniv. Press, London

ENGLISH POETRY FROM CHAUCER TO BLAKE

Course Code: **Credit Units: 06**

Course Objective:

The course includes a study of English poetry from Chaucer of the later Middle Age to the Age of Transition. It has representative poets from different ages and their poems. This course will enable the students to get a broad perspective of the important periods of English Poetry and different genres of poetry. It will also tackle such issues as - poet in relation to society, themes of nature, imagination, etc

Text:

1.	Geoffrey Chaucer	-	Prologue to the Canterbury Tales
2.	William Shakespeare	-	True Love (Sonnet No. 116)
3.	Edmund Spenser	-	One Day I Wrote Her Name (Sonnet No. 75)
4.	John Donne	-	The Canonization, TheSunne Rising
5.	John Milton	-	Paradise Lost Book I. (Non – detailed)
6.	Pope	-	The Rape of the Lock.
7.	Thomas Gray	-	Elegy Written in a Country Churchyard
8.	William Blake	-	The Tiger

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Fowler, Alistair & Scot-Kilvert, Ian: Edmund Spenser. Longman.
- Thomas, C.T. (Ed): Rape of the Lock. Orient Black Swan.
- Guibbory: The Cambridge Companion to John Donne. CambridgeUniversity Press.
- Danielson, Dennis (Ed): Cambridge Companion to Milton. CambridgeUniversity Press.
- De Grazia, Margreta& Wells, Stanley: Cambridge Companion to Shakespeare. CambridgeUniversity Press.
- Zunder, William: Paradise Lost: J Milton. Macmillan.
- Bottrall, Margaret: William Blake: Songs of Innocence and Experience. Octavo.

DRAMA FROM ELIZABETHAN TO RESTORATION AGE

Course Code: **Credit Units: 06**

Course Objective:

The course will give an insight into different genres of Drama from the Elizabethan to the restoration age. For that matter writers and their works, which are representative of the significant periods, are taken up.

Text:

Marlowe	-	Dr. Faustus
Shakespeare	-	Macbeth
Ben Jonson	-	Alchemist (Non-detail study)
Congreve	-	The Way of the World
Sheridan	-	The School for Scandal (Non-detail study)

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Ali, Amir. Basic Introduction to Shakespeare. OxfordUniversity Press.
- Bloom, Harold. *Christopher Marlowe.*New York: Chelsea House, 1986.
- *Clemen, Wolfgang. Shakespeare's Dramatic Art: Collected Essays. New York: Routledge, 2005.*
- Holdsworth, Roger Victor. Jonson: Everyman IN HIS Humor and The Alchemist: A Casebook. Macmillan.
- Lyons, Patric. Congreve: Comedies. Macmillian.
- Morwood, James and David Crane. Eds., Sheridan Studies. CambridgeUniversity Press, 1995.
- Taylor, D. Crane. William Congreve. Oxford University Press, 1931.

ECONOMICS – I (MICRO ECONOMICS)

Course Code: **Credit Units: 02**

Course Objective:

Understanding of some basic economic concepts and developing economic reasoning which the learners can apply in their day-to-day life as citizens, professionals and consumers. It will also equip them with the basic tools of economics and statistics to analyse economic issues.

Course Contents:

Module I: Nature and Scope of Economics
Definition of economics.
Nature and scope of economics.
Micro Economics and Macro Economics.
Relationship with other disciplines.

Module II: Consumer Behaviour
Fundamental concept of utility.
Relationship between utility and demand.
Assumption of utility analysis.
Total and Marginal utility.
Law of Diminishing Marginal Utility.

Module III: Elements of Demand and Supply
Types of demand.
Assumptions of demand.
Factors of demand
Law of demand, Demand schedule and demand curve.
Law of downward sloping of demand curve.
Exceptions to the law of demand.
Demand movement and shift.
The supply schedule and curve.
Factors of supply.

Module IV: Elasticity of Demand and Supply
Definition of elasticity of demand.
Price elasticity of demand.
Methods of measuring elasticity.
Cross elasticity and income elasticity of demand.
Price elasticity of supply.
Methods of measuring price elasticity of supply.

Module V: The Indifference Curve
Nature and assumptions of indifference curve.
Properties of indifference curve analysis.
Marginal rate of substitution.
Consumer's equilibrium.
Substitution and income effect.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- H.L. Ahuja – Microeconomics, S. Chand & Co., New Delhi.
- Samuelson &Nordhaus – Economics, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi.
- Bradley R. Schiller – The Economy Today, Mc-Graw Hill Inc. International Edition.

SOCIOLOGY - I

Course Code: **Credit Units: 02**

Course Objective:

This paper gives insight to the students about the life in human society. It enables the students to understand the social values, norms, culture and ethics that operate within the social structure and how it determines much of collective life.

Course Contents:

Module I: Introduction to Sociology
Nature and Scope of Sociology
Relationship of Sociology with other sciences
Basic Concepts: Structure and Function
Status and Role
Groups
Culture
Social Control
Social Stratification
Order and Change

Module II: Dimensions of Society
Theories, research methods, culture and socialization
Social structure, social groups, and social control
Social stratification and social class
Social institutions
Social dynamics and social change

Module III: Culture and Society
Concept of Culture
Types of Society
Social Change & Individuals

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

Text:

- Kuppusawmi, (2002), Introduction to Sociology; Media Promoters and Publishers, Bombay

References:

- Merton R. K. (1972). Social Theory and Social Structure; New Delhi: Amerind Publishing Co.
- Durkheim E. (1958). The Rules of Sociological Method; New York: The Free Press.
- Sweezy P. (1949). Socialism; New York: McGraw-Hill.
- Parish S. M. (1994). Moral Knowing in a Hindu Sacred City; New.York: ColumbiaUniversity Press.
- Benedict R., (1934), Patterns of Culture; New York: Mentor Books**.**
- Helman C.G. (1994) Culture, Health & Illness; 3rd Edition, Oxford: Butterworth-Heinemann.
- Hewitt J. P., (1991). Self and Society. Boston: Allyn Bacon.
- Shorter E. (1975), The Making of the Modern Family; New York: Basic Books.

HISTORY OF ENGLISH LANGUAGE

Course Code: **Credit Units: 06**

Course Objective:

The course is designed to make the students understand something of the structure of the language of their study. It also looks at its position in the world diachronically and its relation to other tongues, the wealth of its vocabulary together with the processes in which that vocabulary has been and is being enriched. The history of a language is intimately bound up with the history of the peoples who speak it and so the complex relationships among the many different varieties of speech that are gathered under the single name of the English language will also be discussed.

Course Contents:

Module I
The English Language- Old English, Foreign Influences on English; 450- 1066, Middle English, Renaissance. 1066- 1485

Module II
Theories on the Origin of Language;

Module III
Indo European family of languages; Grimm's Law; Verner's Law; The Great Vowel Shift.

Module IV
Characteristics of English; Structure; Word formation processes; Phonetic Change.

Module V
From Island Tongue to World Language - Indian English and American English.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Gerry Knowles. 1997. A Cultural History of the English Language. London. Arnold.
- Albert C Baugh. 2002. A History of the English Language. Fifth edition. London. Rutledge.
- Crystal, David. 2003. English as a Global Language. CambridgeUniversity Press.
- Crystal, David. CambridgeEncyclopaedia of the English Language. CambridgeUniv. Press
- Ramanathan, Vaidehi.English Vernacular Divide, The: Postcolonial Language Politics and Practice. Orient Black Swan
- Wood F T. An Outline History of the English Language. Macmillan
- Bloomfield, Leonard. An Introduction to the Study of Language. John Benjamins

ENGLISH POETRY FROM WORDSWORTH TO TENNYSON

Course Code: **Credit Units: 06**

Course Objective:

The course includes a study of English poetry from Wordsworth of the Romantic Age to Tennyson of the Victorian Age. It has representative poets from these ages and their poems. This course will enable the students to get a broad perspective of the important as well as prolific periods of English Poetry and different genres of poetry. It will also tackle such issues as - poet in relation to society, themes of nature, imagination, the Victorian Dilemma, etc.

Text:

1.	William Wordsworth	-	Tintern Abbey, Ode on the Intimations of Immortality.
2.	Samuel Taylor Coleridge	-	Ode to Dejection, Kubla Khan.
3.	Shelley	-	Ode to the West Wind.
4.	John Keats	-	Ode to Nightingale, Ode on a Grecian Urn.
5.	Byron	-	She Walks in Beauty
6.	Browning	-	The Last Ride Together, My last Duchess.
7.	Matthew Arnold	-	DoverBeach.
8.	Tennyson	-	Ulysses.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Roe, Nichole: Romanticism. OxfordUniversity Press.
- Wolfson, Susan J: Cambridge Companion to Keats. CambridgeUniversity Press.
- Fraser, George Sutherland: John Keats: Odes: A Casebook. Macmillan.
- Robinson, Daniel: A Century of Sonnets: The Romantic Era Revival. OxfordUniversity Press.
- Palmer, David John: Tennyson. OhioUniversity Press.

MODERN DRAMA

Course Code: **Credit Units: 06**

Course Objective:

The study of Modern plays will help students understand the complex relationship of play, theater and audience as also their associated theatrical techniques. The study of prescribed texts will also help students in understanding certain socio-political issues of the times.

Text:

T.S. Eliot	-	Murder in the Cathedral
G.B. Shaw	-	Pygmalion
Arthur Miller	-	The Death of a Salesman
John Osborne	-	Look Back in Anger
Harold Pinter	-	The Caretaker

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Brown, John R. Theatre Language: A Study of Arden, Osborne, Pinter and Wesker. London: Allen Lane, 1972.
- Dillon, Cynthia Bishop. The Playwriting Self of Bernard Shaw. Southern IllinoisUniversity Press, 1991.
- Malamud, Randy. T. S. Eliot's drama: A Research and Production Sourcebook.London: Greenwood Press, 1992.
- Raby, Peter. Ed., TheCambridge Companion to Harold Pinter. HomertonCollege: CambridgeUniversity Press, 2001.

ECONOMICS – II
(MICRO ECONOMICS)

Course Code: **Credit Units: 02**

Course Objective:

Understanding of some basic economic concepts and developing economic reasoning which the learners can apply in their day-to-day life as citizens, professionals and consumers. It will also equip them with the basic tools of economics and statistics to analyse economic issues.

Course Contents:

Module I: Production Analysis
Concept of production.
Factors and assumptions of production.
The production function.
Total, Average and Marginal Product.
Law of Variable Proportions.
Law of Diminishing Returns.
Relationship between average revenue and marginal revenue.

Module II: Analysis of Costs
Concept of cost, Analysis of various types of costs.
Total, average and marginal cost.
Nature of cost curve in short run and long run.
U-shaped short run average cost curve.

Module III: Market Structure and Product Pricing in Perfect Competition
Elements of market.
Types of market structure.
Equilibrium of firm and industry under perfect competition.
Perfect and pure competition.
Determination of price under perfect competition.

Module IV: Market Structure and Product Pricing in Imperfect Competition
Concept of monopoly.
Types of monopoly.
Determination of price in monopoly market.
Price discrimination in monopoly market.
Concept of monopolistic competition and oligopoly.
Determination of product pricing and product differentiation in monopolistic condition.
Product pricing and price leadership in oligopoly condition.

Module V: Factor Pricing
Rent: Ricardian Theory of Rent.
Wages: Modern Theory of Wage.
Interest: Keynes' Theory of Interest and Modern Theory of Interest.
Profit: Risk, Innovation and Uncertainty Theory of Profit.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- H.L. Ahuja – Microeconomics, S. Chand & Co., New Delhi.
- Samuelson &Nordhaus – Economics, Tata Mc-Graw Hill Publishing Co. Ltd., New Delhi.
- Bradley R. Schiller – The Economy Today, Mc-Graw Hill Inc. International Edition.

SOCIOLOGY - II

Course Code: **Credit Units: 02**

Course Objective:

This course is designed to introduce the students with the fundamental concepts of family and the fabric which binds it along with providing insight into the idea of gender issues and sexuality. Religion being the base of human existence will be discussed while giving glimpses of social interaction. The focus is on making learners able to examine social institutions and processes across a range of historical periods, social structures, and cultures.

Course Contents:

Module I: Families
Meaning of Family
Basic Concept of Family Diversity
Theoretical Perspective on Family
Marriage and Divorce
Alternative Family Forms
Violence and Abuse in Family

Module II: Gender & Sexuality
Gender & Socialization
Perspectives on Gender inequality
Human Sexuality
Sexual orientation & Controversies
Gender & Globalization

Module III: Social Interaction
Social Interaction and everyday life
Micro-sociology and Macro-sociology
Status and Role

Module IV: Sociology of Religion
Distinction between magic, religion and science;
The symbolic nature of religious reality
The social functions of religion.
Types of religious organization.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

Text:

- Kuppusawmi, (2002), Introduction to Sociology; Media Promoters and Publishers, Bombay

References:

- Merton R. K. (1972). Social Theory and Social Structure; New Delhi: Amerind Publishing Co.
- Durkheim E. (1958). The Rules of Sociological Method; New York: The Free Press.
- Sweezy P. (1949). Socialism; New York: McGraw-Hill.
- Parish S. M. (1994). Moral Knowing in a Hindu Sacred City; New.York: ColumbiaUniversity Press.
- Benedict R., (1934), Patterns of Culture; New York: Mentor Books**.**
- Helman C.G. (1994) Culture, Health & Illness; 3rd Edition, Oxford: Butterworth-Heinemann.
- Hewitt J. P., (1991). Self and Society. Boston: Allyn Bacon.
- Shorter E. (1975), The Making of the Modern Family; New York: Basic Books.

20TH CENTURY INDIAN ENGLISH POETRY

Course Code: **Credit Units: 06**

Course Objective:

The study of Translated texts will help students to localize culture and identity through understanding of a wide spectrum of perspectives on Indian nationhood and culture. The study of Modern Indian Poetry will acquaint students with the development of new art form as a result of multiplicity subjective positions initiated by a variety of experiences in Modern India.

Short Stories in translation:

1.	Premchand	-	The Holy Panchayat
2.	IsmatChughtai	-	The Quilt
3.	Ambai	-	The Squirrel
4.	Basheer	-	Daughter
5.	SaadatHasanManto	-	Toba Tek Singh

Indian English Poetry:

1.	H. Derozio	-	Harp of India
2.	Toru Dutt	-	Our Casurina Tree
3.	Sri Aurobindo	-	Rose of God
4.	Sarojini Naidu	-	A Soul's Prayer
5.	N. Ezekiel	-	Night of the Scorpion
6.	K.N. Daruwalla	-	The Ghaghra in Spate
7.	A. Ramanujam	-	Carpe Dien
8.	Kamala Das	-	Dance of Eunuchs
9.	AdilJusswalla	-	See Breeze, Bombay
10.	Gieve Patel	-	On Killing A Tree

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Mehrotra Krishna Arvind. *The OxfordIndia Anthology of Twelve Modern Indian Poets.*Oxforduniv. Press
- Singh R.P. *Anthology of Indian English Poetry*. Orient Black Swan
- Ramanujan A.K. *The Collected Essays of A.K. Ramanujan* Oxford.

ENGLISH NOVEL

Course Code: **Credit Units: 06**

Course Objective:

English Novel being a very important aspect of English literature, this course aims to give a broad understanding of the English Novel. It will give an insight into the major literary periods in relation to the English novel and their related characteristics and issues.

Text:

1.	Jonathan Swift	-	Gulliver's Travels
2.	Jane Austen	-	Pride and Prejudice
3.	Charles Dickens	-	Hard Times
4.	Emily Bronte	-	WutheringHeights
5.	E.M. Foster	-	A Passage to India

Background Topics:

- The English Novel in nineteenth century England, Faith and Doubt
- The Writer and Society
- Fiction and its Readers.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- John Richetti. Cambridge Companion to the Eighteenth Century Novel. CambridgeUniv. Press
- Wilbur L Cross. Development Of The English Novel

LITERARY CRITICISM

Course Code: **Credit Units: 06**

Course Objective:

Literary Criticism has come to hold a prominent place in the study English Literature. The course will give an insight into certain literary traditions in relation to English Literary Criticism. The course will acquaint the students in contemporary issues and trends in literary criticism from Aristotle to the present day.

Text:

1.	Aristotle	-	Poetics
2.	Dryden	-	"Three Unities" formEssay of Dramatic Poesy
3.	Wordsworth	-	Preface to the Lyrical Ballads
4.	Coleridge	-	"Fancy and Imagination'" from BiographiaLiteraria
5.	Arnold	-	The Study of Poetry
6.	T.S. Eliot	-	Tradition and the Individual Talent

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Amian Das Gupta, Poetics. Pearson Education.
- John R. Willingham, A Handbook of Critical Approaches to Literature. OxfordUniversity Press.
- Lodge, Modern Criticism and Theory: AReaders, 2/E. Pearson Education.
- Patric Waugh, Literary Theory and Criticism. OxfordUniversity Press.

20TH CENTURY INDIAN ENGLISH POETRY

Course Code: **Credit Units: 06**

Course Objective:

The study of Translated texts will help students to localize culture and identity through understanding of a wide spectrum of perspectives on Indian nationhood and culture. The study of Modern Indian Poetry will acquaint students with the development of new art form as a result of multiplicity subjective positions initiated by a variety of experiences in Modern India.

Short Stories in translation:

6.	Premchand	-	The Holy Panchayat
7.	IsmatChughtai	-	The Quilt
8.	Ambai	-	The Squirrel
9.	Basheer	-	Daughter
10.	SaadatHasanManto	-	Toba Tek Singh

Indian English Poetry:

11.	H. Derozio	-	Harp of India
12.	Toru Dutt	-	Our Casurina Tree
13.	Sri Aurobindo	-	Rose of God
14.	Sarojini Naidu	-	A Soul's Prayer
15.	N. Ezekiel	-	Night of the Scorpion
16.	K.N. Daruwalla	-	The Ghaghra in Spate
17.	A. Ramanujam	-	Carpe Dien
18.	Kamala Das	-	Dance of Eunuchs
19.	AdilJusswalla	-	See Breeze, Bombay
20.	Gieve Patel	-	On Killing A Tree

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Mehrotra Krishna Arvind. *The OxfordIndia Anthology of Twelve Modern Indian Poets.*Oxforduniv. Press
- Singh R.P. *Anthology of Indian English Poetry*. Orient Black Swan
- Ramanujan A.K. *The Collected Essays of A.K. Ramanujan* Oxford.

ENGLISH NOVEL

Course Code: **Credit Units: 06**

Course Objective:

English Novel being a very important aspect of English literature, this course aims to give a broad understanding of the English Novel. It will give an insight into the major literary periods in relation to the English novel and their related characteristics and issues.

Text:

6.	Jonathan Swift	-	Gulliver's Travels
7.	Jane Austen	-	Pride and Prejudice
8.	Charles Dickens	-	Hard Times
9.	Emily Bronte	-	WutheringHeights
10.	E.M. Foster	-	A Passage to India

Background Topics:

- The English Novel in nineteenth century England, Faith and Doubt
- The Writer and Society
- Fiction and its Readers.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- John Richetti. Cambridge Companion to the Eighteenth Century Novel. CambridgeUniv. Press
- Wilbur L Cross. Development Of The English Novel

LITERARY CRITICISM

Course Code: **Credit Units: 06**

Course Objective:

Literary Criticism has come to hold a prominent place in the study English Literature. The course will give an insight into certain literary traditions in relation to English Literary Criticism. The course will acquaint the students in contemporary issues and trends in literary criticism form Aristotle to the present day.

Text:

7.	Aristotle	-	Poetics
8.	Dryden	-	"Three Unities" formEssay of Dramatic Poesy
9.	Wordsworth	-	Preface to the Lyrical Ballads
10.	Coleridge	-	"Fancy and Imagination'" from BiographiaLiteraria
11.	Arnold	-	The Study of Poetry
12.	T.S. Eliot	-	Tradition and the Individual Talent

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Amian Das Gupta, Poetics. Pearson Education.
- John R. Willingham, A Handbook of Critical Approaches to Literature. OxfordUniversity Press.
- Lodge, Modern Criticism and Theory: AReaders, 2/E. Pearson Education.
- Patric Waugh, Literary Theory and Criticism. OxfordUniversity Press.

20TH CENTURY INDIAN ENGLISH NOVEL

Course Code: **Credit Units: 06**

Course Objective:

This course will orient students towards understanding of Indian English Novel since its beginnings till recent day. To this end the texts will be studied in their relevance to the major sociopolitical issues of the Indian nation in the 20th century. The study of such texts will put in perspective the issues of Indian Culture, Religion and Nationalism.

Text:

1. R.K. Narayan - The Guide
2. Salman Rushdie - Midnight's Children
3. AmitavGhosh - The Shadow Lines
4. Bhabani Bhattacharya - He who Rides a Tiger
5. Kamala Markandaya - Nectar in a Sieve

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Iyengar K.R. Srinivas. Indian Writing in English. Advent Books Division
- Daiches D. Critical Approaches to English Literature. Orient Black Swan.
- V. Padma. Fiction as Window: Critiquing the Indian Literary Cultural Ethos since the1980.Orient Blackswan.
- DodiyaJaydesinh. Indian Women Novelists in English. Sarup and sons.

PROSE DOWN THE AGES

Course Code: **Credit Units: 06**

Course Objective:

This course will introduce the different styles of prose through different ages. It instructs the students how the various styles be examined in the aesthetic structure of prose.

Essays:

- The Suffering Servant of God Life and Death - The Book of Job
- Francis Bacon (1561–1626) – Of Studies, Of Great Place
- Joseph Addison (1672-1719) - Reflections in Westminster Abbey, The Vision of Mirza
- Sir Richard Steele (1672 – 1729) - The Spectator Club
- Oliver Goldsmith (1730 – 1774)) – National Prejudices
- William Hazlit (1778 – 1830) – On Going a Journey
- Charles Lamb (1775–1834) - Dream-Children; a Reverie
- Robert Lynd (1879 - 1949) – On Forgetting
- Walter Benjamin (1892 – 1940) - The Work of Art in the Age of Mechanical Reproduction
- Stephen Leacock (1869 –1944) – My Financial Career

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- W. E. Williams (Editor). 1943. A Book of English Essays (Penguin English Library). Penguin Books Ltd
- Department of English and Modern European Languages. 1998. Forms of English Prose. Oxford
- Ashok Thorat. 1998. Poetry and Minor Forms of English Literature. Oxford
- John J. Gross. 1998. The new Oxford book of English prose. Oxford

LITERARY THEORY

Course Code: **Credit Units: 06**

Course Objective:

This course will familiarize students with the study of major twentieth-century theories and its applications. The course will enable students to comment on various theories and apply them to works of literature and aspects of contemporary culture.

Text:

1.	Ferdinand de Saussure	-	Structuralism
2.	Derrida	-	Structure, Sign, and Play in the Discourse of the Human Sciences
3.	Post Colonialism	-	Definition and Concept.
4.	Elaine Showalter	-	Towards a Feminist Poetics.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- GayatriChakravartySpivak, 'Can the Subaltern speak?' in Colonial Discourse and Post Colonial Theory: A Reader, eds. Patrick Williams and Laura Chrisman (London: Harvester Wheatsheaf, 1994)
- Lodge, Modern Criticism and Theory: A Readers,2/E. Pearson Education.
- Patric Waugh, Literary Theory and Criticism. OxfordUniversity Press.
- Peter Barry, The Beginning Theory.
- Seldon, A Reader's Guide to Contemporary Literary Theory, 5/E. Pearson Education.
- Terry Eagleton, Literary Theory: An Introduction, 2nd ed. (Oxford: Blackwell).
- Young, Robert J C, Postcolonialism: A Very Short Introduction. Oxford.

MODERN ENGLISH POETRY

Course Code: **Credit Units: 06**

Course Objective:

This course will study some poems of representative poets that go into shaping Modernism. The employment of newer styles and techniques in poetry as Myth, Imagery, symbolism and allusions will be dealt. At a broader plane, the texts will be studied in relation to the major socio-political issues around such times that engulf the modern man. The course will study the relationship between the texts and the socio-political issues of the times - unrest in Ireland in the first quarter of 20th century and degeneration of structures and moral values brought about by the two world wars.

Text:

1.	T.S. Eliot	a)	The Love Song of J. Alfred Prufrock
		b)	Gerontion
		c)	Hollow Men
		d)	Sweeney among Nightingales
2.	W.B. Yeats	a)	The Second Coming
		b)	Sailing to Byzantium
		c)	Among School Children
3.	W. H. Auden	a)	In the Memory of W. B. Yeats
		b)	Spain
		c)	September 1, 1939.
4.	G. M. Hopkins	a)	Pied Beauty
5.	Philip Larkin	a)	Wants
6.	Ted Hughes	a)	Jaguar

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Howes, Marjorie,TheCambridge Companion to W. B. Yeats, CambridgeUniversity Press, 2006
- Tate, Allen, T. S. Eliot: The Man and His Work, Penguin, 1971.
- Haffenden, John, W.H. Auden, the Critical Heritage, Routledge&Kegan Paul, 1983.
- Fuller, John, W.H. Auden: A Commentary, PrincetonUniversity Press, 1998

CONTEMPORARY LITERATURE

Course Code: **Credit Units: 06**

Course Objective:

Contemporary literature is an important area of study in the contemporary English Literary Studies. The texts will be discussed in terms of key aspects, including: colonial and post-colonial experience; national, cultural, and racial identity; voice; language; political writing; gender and colonization; exile; and imperialism. Discussing texts in their historical and cultural contexts, the course aims to give students both a broad knowledge of Contemporary literature and in-depth understanding of specific texts and issues.

Text:

1. Margaret Atwood - The Edible Woman
2. V.S. Naipaul - A House for Mr. Biswas
3. Chinua Achebe - Things Fall Apart
4. Sally Morgan - My Place

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Binod Mishra, Explorations in Australian L:iterature. Sarup&Sons.
- EllekeBoehmer, Colonial and Postcolonial Literatures: Migrant Metaphors. Oxford.
- Lazarus, TheCambridge Companion to Postcoloial Studies. Cambridge University Press.

POPULAR FICTION

Course Code: **Credit Units: 06**

Course Objective:

It is quite interesting to study popular forms of novel in literature. The course will locate these popular forms of novel in the domain of novel genre. The course will work out certain novel genres which in the past were not popularly included in literary studies, which in the present times have captured the attention of English literature studies.

Text:

1.	Science Fiction	IssaacAsinov	Foundation
2.	Children's Fiction	Lewis Caroll	Through the Looking Glass
3.	Detective Fiction	Agatha Christie	The Murder of Roger Ackroyd
4.	Spy Thriller	Ian Fleming	FromRussia with Love

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Christopher Pawling, 'Popular Fiction: Ideology or Utopia?,' Popular Fiction and Social Change, ed. Christopher Pawling (London: Macmillan, 1984).
- Umberto Eco, 'Narrative Structure in Fleming,' in the Study of Popular Culture: A Sourcebook, ed. Bob Ashley (London: Pinter, 1989), pp. 124-34.
- DarkoSuvin, 'On Teaching SF Critically,' from Positions and Presupositions in Science Fiction, (London: Macmillan), pp. 86 – 96.
- Felicity Hughes, 'Children's Literature: Theory and Practice,' ELH. 45 (1978), pp. 542-62.

MODERN ENGLISH NOVEL

Course Code: **Credit Units: 06**

Course Objective:

This course, through study some representative texts, will help students understand Modernism as a different art from carved out by a peculiar blend of autobiography and art and employment of new literary styles and techniques as Bildungsroman, Stream of Consciousness and Epiphany. Besides, the study of such art from will help students understand the writers' subjective positions in their experience and exploration of human relationships ushered by the modern times.

Text:

1. D. H. Lawrence - Sons and Lovers
2. Joseph Conrad - Lord Jim
3. James Joyce - Portrait of an Artist as a Young Man

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Sagar, Keith, The Art of D. H. Lawrence, CambridgeUniversity Press, 1975
- Sander, Scott Russell, D. H. Lawrence: The World of the Five Major Novels, Viking Press, 1974
- H. Stape, ed., The Cambridge Companion to Joseph Conrad, CambridgeUniversity Press, 2006
- Brady, Philip and James F. Carens, eds. Critical Essays on James Joyce's A Portrait of the Artist as a Young Man, New York: G. K. Hall, 1998.
- Wollaeger, Mark A., ed. James Joyce's A Portrait of the Artist as a Young Man: A Casebook, Oxford, New York, 2003.
- *Connolly, Thomas E., Joyce's Portrait: Criticisms & Critiques, Appleton-Century-Crofts, New York. 1962.*

AMERICAN LITERATURE

Course Code: **Credit Units: 06**

Course Objective:

American Literature as part of English Literary study has gained prominence in the present times. The course will give a detailed study of the Anglo American Writing in relation to contemporary culture and issues.

Text:

1.	Hawthorne	-	Scarlet Letter
2.	Mark Twain	-	The Adventures of Huckleberry Finn
3.	Hemingway	-	The Old man and the Sea
4.	Robert Frost	-	After Apple Picking, Spring Pools, Stopping by Woods on a Snowy Evening.
5.	Emily Dickenson	-	Hope is a thing with feather, Because I could not stop for death.
6.	Walt Whitman	-	When Lilacs last in the Dooryard Bloomed, On the Beach at Night, to a Stranger

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Background Topics:

- Puritan America, Conglomeration of American society, Racial issues in America, American Individualism of the nineteenth Century, American Humour.

MODERN EUROPEAN DRAMA

Course Code: **Credit Units: 06**

Course Objective:

This module seeks to extend students' knowledge and understanding of modern drama to a wider European context. In so doing it will enhance their awareness and ability to handle critical and theoretical approaches to the study of drama, as well as enlarging their understanding of European cultural issues.

Text:

1. Henrik Ibsen - A Doll's House
2. Bretold Brecht - Mother Courage
3. Samuel Beckett - Waiting for Godot
4. Luigi Pirandello - Six Characters in Search of an Author

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Styan, J. L. Modern Drama In theory and Practice: Vol. I, Realism and Naturalism, Cambridge University Press, UK, 1983.
- Monaco, Paul, Modern European culture and Consciousness, 1870 – 1970, State University of New York Press, Albany, 1983.

INTRODUCTION TO LINGUISTICS

Course Code: **Credit Units: 06**

Course Objective:

This paper aims to provide the learner the basic knowledge of Linguistics, various aspects of language study and its applications. The focus of the paper is also to introduce the learners with the basics of correct pronunciation and articulation and thereby to improve their communication skills.

Course Contents:

Module I: Introduction
What is language ?
Characteristics of human language.
Linguistics: Definition and explanation.
Importance and applications of linguistics.
Levels of language study.

Module II: Phonetics and Phonology
Difference between Phonetics and Phonology.
Classification of sound system.
Articulation and Production of sounds.
Tone, Accent and Stress.

Module III: Morphology
Suffixes and Prefixes
Word Formation process

Module IV: Semantics
Meaning.
Types of Meaning
Sense and Reference

Module V: Syntax
Theories of Sentence structure.
Sentence structure analysis.

Examination Scheme:

Components	CT	S	A	EE
Weightage (%)	15	10	05	70

Text & References:

- Adams ,V.1973. An Introduction to Modern English Word Formation.London: Longman
- Chomsky, N., and M.Halle.1968.The sound pattern of English.New York: Harper and Row.
- Lyons J, 1977.Semantics. 2 Vols. Cambridge: CambridgeUniversity Press.
- Crystal D.1997. Encyclopedia of Language: 2nd Vol., Cambridge: CambridgeUniversity Press