SCHOOL OF ENGINEERING AND TECHNOLOGY

Bachelor of Technology- Computer Science & Engineering
And
Specialization

Programme Code: SET0101
Duration- 4 Years Full Time

PROGRAM STRUCTURE
AND
CURRICULUM & SCHEME OF EXAMINATION
2019-20

Program and Course Structure

OF

Bachelor of Technology- Computer Science & Engineering

B.Tech-CSE with specialization in Artificial Intelligence & Machine Learning

B.Tech-CSE with specialization in BLOCKCHAIN

B.Tech-CSE with specialization in Cyber Security & Forensics

B.Tech CSE with specialization in Data Science

B.Tech-CSE with specialization in Internet of Things & Applications

B.Tech-CSE with specialization in Bioinformatics

B.Tech-CSE with specialization in Business Analytics & Optimization

B.Tech-CSE Cloud Computing & Virtualization

B.Tech-CSE Cloud Technology & Information Security

1. Standard Structure of the Program at University Level

1.1 Vision, Mission and Core Values of the University

Vision of the University

To serve the society by being a global University of higher learning in pursuit of academic excellence, innovation and nurturing entrepreneurship.

Mission of the University

1. **Transformative educational experience**
2. **Enrichment by educational initiatives that encourage global outlook**
3. **Develop research, support disruptive innovations and accelerate entrepreneurship**
4. **Seeking beyond boundaries**

Creative Campaign Can be TEDs: This is guiding principle for promotion and wide circulation among various stakeholder.
Guidelines: Similar Mnemonics can be designed by schools.

Core Values

- **Integrity**
- **Leadership**
- **Diversity**
- **Community**

Note: Detailed Mission Statements of University can be used for developing Mission Statements of Schools/ Departments.

1.2 Vision and Mission of the School

Vision of the School

To become a globally acclaimed institution of higher learning in engineering and technology promoting excellence in research, innovation and entrepreneurship

Mission of the School

1. **To impart quality education with strong industry & academic connectivity in the expanding fields of Engineering and Technology in a conductive and enriching learning environment.**
2. **To product technocrats equipped with technical & soft skills and experiential learning required to stay current with the modern tools in emerging technologies to fulfill professional responsibilities and uphold ethical values.**
3. **To inculcate a culture of interdisciplinary research, innovation and entrepreneurship to provide sustainable solutions to meet the growing challenges and societal needs.**
4. **To foster collaborative learning and to play adaptive leadership role in professional career and pursuit of higher education through effective mentoring and counselling.**

1.2.1Vision and Mission of the Department

Vision of the Department

To be known and recognized as the fountainhead of excellence in technical knowledge and research in computer science and engineering, and draw to it the students and scholars across nations.

Mission of the Department

1. To facilitate and foster the academia industry collaboration to enhance entrepreneurship skills and acquaintance with corporate culture.
2. To strengthen core competences of students to be successful, ethical , effective problem solver in Computer Science & Engineering through analytical learning
3. To promote research based activities in emerging areas of technology convergence.
4. To induce moral values and spirit of social commitment.

1.3 Programme Educational Objectives (PEO)

1.3.1 Writing Programme Educational Objectives (PEO)

The Educational Objectives of UG Program in Computer Science Engineering are:

PEO1 : The Graduate will ensconce himself/herself as effective professionals by solving real life problems using exploratory and analytical skills along with the knowledge acquired in the field of Computer Science and Engineering.

PEO2 : The Graduate will demonstrate his/her ability to accustom to rapidly changing environment in advanced areas of Computer Science and scale new height in their profession through lifelong learning.

PEO3 : The Graduate will have the ability to work and communicate effectively as a team member or leader to complete the task with minimal resources, meeting deadlines.

PEO4 : The Graduate will embrace professional code of ethics in the profession while deliberately being part of projects which contributes to the society at large without disturbing the ecological balance.

Methods of Forming PEO's

STEP 1:	The needs of the Nation and society are identified through scientific publications, industry interaction and media.
STEP 2.	Taking the above into consideration, the PEOs are established by the coordination Committee of the department.
STEP 3.	The PEOs are communicated to the alumni and their suggestions are obtained.
STEP 4.	The PEOs are communicated to all the faculty members of the department and their feedback is obtained.
STEP 5.	The PEOs are then put to the Board of Studies of the department for final approval.

[Note: Prepare a file for the same, how you arrive for PEO's]

1.3.2 Map PEOs with School Mission Statements:

PEO Statements	School Mission 1	School Mission 2	School Mission 3	School Mission 4
PEO1:	**3**	**3**	**2**	**2**
PEO2:	**2**	**3**	**2**	**1**
PEO3:	**2**	**2**	**2**	**3**
PEO4:	**2**	**1**	**3**	**1**

Enter correlation levels 1, 2, or 3 as defined below:

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High)

If there is no correlation, put "-"

1.3.2.1 Map PEOs with Department Mission Statements:

PEO Statements	Department Mission 1	Department Mission 2	Department Mission 3	Department Mission 4
PEO1:	2	3	2	1
PEO2:	1	3	3	1
PEO3:	3	2	1	1
PEO4:	1	2	2	3
PEO5:	2	3	2	1

Enter correlation levels 1, 2, or 3 as defined below:

1. Slight (Low) 2. Moderate (Medium) 3. Substantial (High)

If there is no correlation, put "-"

1.3.3 Program Outcomes (PO's)

PO1: **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

PO6: **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PSO1: Familiarity and practical proficiency with a broad area of programming concepts and provide new ideas and innovations towards research and societal issues.

PSO2: Understand, analyze and develop computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics and networking for efficient design of computer-based systems of varying complexity.

PSO3: Apply standard Software Engineering practices and strategies in software project development using open-source programming environment to deliver a quality product for business success.

PSO4: Be acquainted with the contemporary issues, latest trends in technological development and thereby innovate new ideas and solutions to existing environmental and societal problems.

PSO5: To prepare graduates to apply their skills in creating innovative computing solutions by employing effective communication, teamwork, leadership, ethical practices and professionalism.

1.3.4 Mapping of Program Outcome Vs Program Educational Objectives

Mapping	PEO1	PEO2	PEO3	PEO4
PO1	3	3	2	1
PO2	3	3	3	1
PO3	2	2	3	3
PO4	2	2	3	2
PO5	2	3	2	2
PO6	1	2	2	3
PO7	1	1	2	3
PO8	1	1	2	3
PO9	1	2	3	1
PO10	1	1	3	2
PO11	3	2	3	1
PO12	2	3	1	1
PSO1	2	3	1	3
PSO2	3	3	2	2
PSO3	3	3	2	2
PSO4	2	2	1	3
PSO5	3	2	3	1

1. Slight (Low) ***2. Moderate (Medium)*** ***3. Substantial (High)***

School of Engineering and Technology							
B.Tech-Computer Science Engineering , Integrated B-Tech (CSE) + MBA, Integrated B-Tech (CSE) + M-Tech (SE)							
Batch: 2019 Onwards						TERM: I	
S. No.	**Course Code**	**Course**	**Teaching Load**			**Credits**	**Pre-Requisite/Co Requisite**
			L	**T**	**P**		
THEORY SUBJECTS							
1	CSE113	Programming for Problem Solving	3	0	0	3	
2	MTH142	Calculus and Abstract Algebra	3	1	0	4	
3	PHY117	Semiconductor Physics	2	1	0	3	
4	EEE112	Principles of Electrical and Electronics Engineering	2	1	0	3	
	OR						
	CHY111	Engineering Chemistry	3	0	2		
5	EVS112	Environmental Studies	3	0	0	3	
	OR						
	HMM111	Human Value & Ethics	2	0	0	2	
Practical/Viva-Voce/Jury							
6	ARP101	Communicative English-1	1	0	2	2	
7	CSP113	Programming for Problem Solving Lab	0	0	2	1	
8	CSP101	Introduction to Computer Science and Engineering	0	0	2	1	
9	MEP106	Computer Aided Design & Drafting	0	0	3	1.5	
	OR						
	MEP105	Mechanical Workshop	0	0	3		
10	EEP112	Principles of Electrical and Electronics Engineering	0	0	2	1	
	OR						
	CHY111	Engineering Chemistry Lab	0	0	2		
11	PHY161/162	Physics Lab –I / Physics Lab-II	0	0	2	1	
TOTAL CREDITS						**23.5/22.5**	

School of Engineering and Technology							
B.Tech-Computer Science Engineering , Integrated B-Tech (CSE) + MBA, Integrated B-Tech (CSE) + M-Tech (SE)							
Batch: 2019 Onwards						TERM: II	
S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1	CSE114	Application based Programming in Python	3	0	0	3	
2	MTH145	Probability and Statistics	3	1	0	4	
3	CHY111	Engineering Chemistry	3	0	0	3	
	OR						
	EEE112	Principles of Electrical and Electronics Engineering	2	1	0		
4	HMM111	Human Value & Ethics	2	0	0	3	
	OR						
	EVS112	Environmental Studies	3	0	0	3	
5	PHY116	Engineering Physics	2	1	0	3	
Practical/Viva-Voce/Jury							
6	ARP102	Communicative English -2	1	0	2	2	
7	CSP103	Multimedia Application Lab	0	0	2	1	
8	CSP114	Application based Programming in Python	0	0	2	1	
9	MEP105	Mechanical Workshop	0	0	3	1.5	
	OR						
	MEP106	Computer Aided Design & Drafting	0	0	3		
10	CHY111	Engineering Chemistry	0	0	2	1	
	OR						
	EEP112	Principles of Electrical and Electronics Engineering	0	0	2		
11	PHY161/162	Physics Lab –I / Physics Lab-II	0	0	2	1	
TOTAL CREDITS						22.5/23.5	

School of Engineering and Technology							
B.Tech-Computer Science Engineering , Integrated B-Tech (CSE) + MBA, Integrated B-Tech (CSE) + M-Tech (SE)							
Batch: 2019 Onwards						TERM: III	
S. No.	**Course Code**	**Course**	**Teaching Load**			**Credits**	**Pre-Requisite/Co Requisite**
			L	**T**	**P**		
THEORY SUBJECTS							
1	BTY223	Introduction to Biology for Engineers	2	0	0	2	
2	CSE242	Data Structures	3	0	0	3	
3	CSE243	Object Oriented Programming Using Java	3	0	0	3	
4	CSE244	Principles of Operating System	3	0	0	3	
5	CSE245	Discrete Structures	3	1	0	4	
6	CSE247	Computer Organization and Architecture	3	0	0	3	
Practical/Viva-Voce/Jury							
7	ARP203	Logical Skills Building and Soft Skills	1	0	2	2	
8	CSP242	Data Structures Lab	0	0	2	1	
9	CSP243	Object Oriented Programming Using Java	0	0	2	1	
10	CSP244	Principles of Operating System Lab	0	0	2	1	
11	CSP297	Project Based Learning (PBL) -1	0	0	2	1	
12	CSP299	Summer Internship-I	-	-	-	1	
TOTAL CREDITS						**25**	

School of Engineering and Technology							
B.Tech-Computer Science Engineering							
Batch: 2019 Onwards						TERM: IV	
S. No.	**Course Code**	**Course**	**Teaching Load**			**Credits**	**Pre-Requisite/Co Requisite**
			L	**T**	**P**		
THEORY SUBJECTS							
1	CSE248	Computer Networks	3	0	0	3	
2	CSE249	Data Base Management System	3	0	0	3	Discrete Structures
3	CSE250	Theory of Computation	3	1	0	4	
4	PE-1	Program Elective-1	3	0	0	3	
	CSE011	Mathematical Techniques					
	CSE012	Introduction to Graph Theory and its Applications					
5	OE1	Open Elective – 1	2	0	0	2	
Practical/Viva-Voce/Jury							
6	CSEP48	Computer Networks Lab	0	0	2	1	
7	CSEP49	Data Base Management System Lab	0	0	2	1	
8	ARP204	Quantitative and Qualitative Aptitude Sill Building	1	0	2	2	
9	CSP298	Project Based Learning (PBL) -2	0	0	2	1	PBL-I
TOTAL CREDITS						**20**	

School of Engineering and Technology							
B.Tech-Computer Science Engineering , Integrated B-Tech (CSE) + MBA, Integrated B-Tech (CSE) + M-Tech (SE)							
Batch: 2019 Onwards						TERM: V	
S. No.	**Course Code**	**Course**	**Teaching Load**			**Credits**	**Pre-Requisite/Co Requisite**
			L	**T**	**P**		
THEORY SUBJECTS							
1	CSE350	Design and Analysis of Algorithm	3	1	0	4	Data Structure
2	CSE351	Software Engineering and Testing Methodologies	3	0	0	3	
3		Program Elective-2	3	0	0	3	
	CSE021	Introduction to Cloud Computing					
	CSE022	Android Application Development					
4	OE-2	Open Elective – 2	3	0	0	3	
Practical/Viva-Voce/Jury							
5	ECC001	Community Connect	-	-	-	2	
6	ARP301	Personality Development and Decision making Skills	1	0	2	2	
7	CSP350	Design and Analysis of Algorithm Lab	0	0	2	1	Data Structure Lab
8	CSP395	Technical Skill Enhancement Course-1 Simulation Lab	0	0	2	1	Operating system, Database Management system
9	CSP397	Project Based Learning (PBL) -3	0	0	2	1	PBL-2
10	CSP399	Summer Internship-II	-	-	-	1	Summer Internship-I
TOTAL CREDITS						**21**	

S. No.	Course Code	Course	Teaching Load L	T	P	Credits	Pre-Requisite/Co Requisite
School of Engineering and Technology							
B.Tech-Computer Science Engineering , Integrated B-Tech (CSE) + MBA, Integrated B-Tech (CSE) + M-Tech (SE)							
Batch: 2019 Onwards						TERM: VI	
THEORY SUBJECTS							
1	HMM305	Management for Engineers	3	0	0	3	
2	CSE352	Web Technologies	2	0	0	2	Java
3	CSE353	Compiler Design	3	0	0	3	
4	PE3	Program Elective-3	3	0	0	3	
	CSE031	Digital Image Processing					
	CSE032	Cryptography and Network Security					
5	PE4	Program Elective-4	3	0	0	3	
	CSE041	Software Project Management					
	CSE042	Software Testing					
6	OE-3	Open Elective – 3	3	0	0	3	
Practical/Viva-Voce/Jury							
7	ARP302	Campus to Corporate	1	0	2	2	
8	CSP352	Web Technologies Lab	0	0	2	1	Java
9	CSP353	Compiler Design Lab	0	0	2	1	Principles of Operating system Lab
10	CSP396	Technical Skill Enhancement Course-2(Application Development Lab)	0	0	2	1	
11	CSP398	Project Based Learning (PBL) -4	0	0	2	1	PBL-3
TOTAL CREDITS						**23**	

School of Engineering and Technology							
B.Tech-Computer Science Engineering , Integrated B-Tech (CSE) + MBA, Integrated B-Tech (CSE) + M-Tech (SE)							
Batch: 2019 Onwards						TERM: VII	
S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite
			L	T	P		
THEORY SUBJECTS							
1	CSE354	Artificial Intelligence	3	0	0	3	
2		Program Elective-5	3	0	0	3	
	CSE051	Wireless Networks					
	CSE052	Risk Management					
3		Program Elective-6	3	0	0	3	
	CSE061	Introduction to Internet of Things					
	CSE062	Mobile Computing					
4		Comprehensive Examination	0	0	0	0	Audit
5	OE4	Open Elective - 4	3	0	0	3	
Practical/Viva-Voce/Jury							
6	CSP354	Artificial Intelligence Lab	0	0	2	1	
7	CSP497	Major Project- 1	-	-	-	3	PBL-4
8	CSP499	Summer Internship-III	-	-	-	1	Summer Internship-II
TOTAL CREDITS						17	

School of Engineering and Technology							
B.Tech-Computer Science Engineering , Integrated B-Tech (CSE) + MBA, Integrated B-Tech (CSE) + M-Tech (SE)							
Batch: 2019 Onwards						TERM: VIII	
S. No.	**Course Code**	**Course**	**Teaching Load**			**Credits**	**Pre-Requisite/Co Requisite**
			L	**T**	**P**		
THEORY SUBJECTS							
Practical/Viva-Voce/Jury							
1	CSP498	Major Project - 2	-	-	-	8	Major Project - 1
TOTAL CREDITS						**8**	
		Term	L	T	P	**Credits**	TTH
		TERM-I.	19	3	20	23.5/22.5	42
		TERM-II.	19	3	18	22.5/23.5	40
		TERM-III.	18	1	10	25	29
		TERM-IV.	19	1	18	20	38
		TERM-V.	13	1	8	21	22
		TERM-VI.	18	0	10	23	28
		TERM-VII.	12	0	2	17	14
		TERM-VIII.	-	-	-	8	0
		TOTAL CREDITS				160	

Syllabus: CSE113: Programming for problem solving

School: SET		**Batch :2019-2013**		
Program: B.Tech		**Current Academic Year: 2019-20**		
Branch: ALL		**Semester:1**		
1	Course Code	**CSE113**	Course Name: Programming for problem solving	
2	Course Title	Programming for problem solving		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	Core		
5	Course Objective	1. Learn basic programming constructs –data types, decision structures, control structures in C 2. learning logic aptitude programming in c language 3. Developing software in c programming		
6	Course Outcomes	Students will be able to: CO1: Create flowchart , algorithm and Pseudo-code CO2: Understanding basic C concept CO3: Implement Array and Functions CO4: Understand and implement Pointers CO5: Apply user-defined data types		
7	Course Description	Programming for problem solving gives the Understanding of C programming and implement code from flowchart or algorithm		
8	Outline syllabus			CO Mapping
	Unit 1	**Logic Building**		
	A	Flowchart: Elements, Identifying and understanding input/ output, Branching and iteration in flowchart		CO1,
	B	Algorithm design: Problem solving approach(top down/bottom up approach)		CO1
	C	Pseudo Code : Representation of different construct, writing pseudo-code from algorithm and flowchart		CO1
	Unit 2	**Introduction to C Programming**		
	A	Introduction to C programming language, Data types, Variables, Constants, Identifiers and keywords, Storage classes		CO2
	B	Operators and expressions, Types of Statements: Assignment, Control, jumping.		CO2
	C	Control statements: Decisions, Loops, break, continue		CO2
	Unit 3	**Arrays and Functions**		
	A	Arrays: One dimensional and multi dimensional arrays: Declaration, Initialization and array manipulation (sorting, searching).		CO3
	B	Functions: Definition, Declaration/Prototyping and Calling, Types of functions, Parameter		CO3

		passing: Call by value, Call by reference.	
	C	Passing and Returning Arrays from Functions, Recursive Functions.	CO3
	Unit 4	**Pre-processors and Pointers**	
	A	Pre-processors: Types, Directives, Pre-processors Operators (#,##,\) , Macros: Types, Use, predefined Macros	CO4
	B	Pointer: Introduction, declaration of pointer variables, Operations on pointers: Pointer arithmetic, Arrays and pointers, Dynamic memory allocation.	CO4
	C	String: Introduction, predefined string functions, Manipulation of text data, Command Line Arguments.	CO4
	Unit 5	**User Defined Data Types and File Handling**	
	A	Structure and Unions: Introduction, Declaration, Difference, Application, Nested structure, self-referential structure, Array of structures, Passing structure in function.	CO5
	B	Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file,	CO5
	C	Creating a data file, Opening and closing a data file, Various I/O operations on data files: Storing data or records in file, adding records, Retrieving, and updating Sequential file/random file.	CO5
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*	
	Other References	1. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004. 2. E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hill- 1999	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Create flowchart , algorithm and Pseudo-code	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
2.	CO2: Understanding basic C concept	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
3.	CO3: Implement Array and Functions	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5

4.	CO4: Understand and implement Pointers	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
5.	CO5: Apply user-defined data types	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5

PO and PSO mapping with level of strength for Course Name Programming for problem solving (Course Code CSE 113)

	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CSE 113	CO1	3	2	3	-	-	-	-	-	-	-	2	1	3	2	2	1	2
	CO2	3	2	3	-	-	-	-	-	-	-	2	1	3	2	2	1	2
	CO3	3	2	3	-	-	-	-	-	-	-	1	1	2	3	2	1	2
	CO4	3	2	3	-	-	-	-	-	-	-	3	2	3	2	1	1	1
	CO5	3	2	3	-	-	-	-	-	-	-	3	1	2	2	2	1	3

Syllabus: CSP 113: Programming for problem solving Lab

School: SET		**Batch: 2019**	
Program: B.Tech.		**Current Academic Year: 2019-19**	
Branch: CSE		**Semester: I**	
1	Course Code	CSP113	
2	Course Title	Programming for problem solving Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1. Learn basic programming constructs –data types, decision structures, control structures in C 2. learning logic aptitude programming in c language 3. Developing software in c programming	
6	Course Outcomes	Students will be able to: CO1: Understand core concept of c Programming CO2: Implement Array and String CO3: Implement Functions CO4: Use Union and Structure CO5: Understand and implement Pointers	
7	Course Description	Programming for problem solving gives the Understanding of C programming and implement code from flowchart or algorithm	
8	Outline syllabus		CO Mapping
	Unit 1	**Logic Building**	**CO1**
		Draw flowchart for finding leap year	
		Write a c Program to Add Two Integers	
		Write a program to create a calculator	
	Unit 2	**Introduction to C Programming**	**CO2**
		Write a c program to convert length meter to cm	
		Write a c program to convert temp	
		Write a c program to swap two numbers	
	Unit 3	**Arrays and Functions**	**CO3**
		Write a c program to calculate the average using arrays	
		Write a c program to find the largest element of the array	
	Unit 4	**Pre-processors and Pointers**	**CO4**
		Write a c program to swap two values using pointers	
		Write a c program to find largest number from array using pointers	
	Unit 5	**User Defined Data Types and File Handling**	**CO5**
		Write a c program to store information of a student using structure	
		Write a c program to store information of a student using union	
	Mode of	Practical	

	examination				
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*			
	Other References	4. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004. 5. E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hill- 1999			

Course outline

This course implements array and pointer and Recursive applications. The course talks primarily about Array, string, functions, structure & union and Pointers etc.

Course Evaluation	
Attendance	None
Any other	CA judged on the practicals conducted in the lab , weightage may be specified
References	
Text book	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*
Other References	1. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004. 2. E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hill- 1999
Softwares	Turbo C

Syllabus: MTH 142:Calculus And abstract Algebra

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: CSE		**Semester: 1**
1	Course Code	**MTH 142**
2	Course Title	**Calculus and Abstract Algebra**
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.
6	Course Outcomes	CO1: Explain the concept of differential calculus, illustrate thecurvature and Maxima, minima and saddle point. (K2, K3, K4) CO2: Explain the basic concepts matrices and determinate, evaluate system of linear equation by using rank and inverse method. (K2, K3, K5) CO3: Explain the basic concept of sets, relation, functions, groups Rings and Field. (K2, K4) CO4: Discuss the basic of Vector spaces. (K1, K3) CO5: Describe and use the linear transformation and evaluate nullity and kernel. (K1, K2, K3, K5) CO6:Explain the concept of Eigen values and Eigen vectors; evaluate the diagonalization of matrices, explain the basic introduction of Inner product spaces.(K2, K3, K4, K5)
7	Course Description	This course is an introduction to the fundamental of Mathematics. The primary objective of the course is to develop the basic understanding of differential and integral calculus, linear Algebra and Abstract Algebra.

8	**Outline syllabus: Calculus and Abstract Algebra**		**CO Mapping**
	Unit 1	**Calculus**	
	A	Differentiation, Taylor's and Maclaurin theorems with remainders; indeterminate forms, L' Hospital's rule.	CO1

	B	Maxima and minima, Partial derivatives, Euler's theorem.			CO1
	C	Total derivative. Evaluation of double integration. Applications of double integral (to calculate area).			CO1
	Unit 2	**Matrices**			
	A	Matrices, vectors: addition and scalar multiplication, matrix multiplication.			CO2
	B	Linear systems of equations, linear Independence, rank of a matrix, determinants, Cramer's Rule			CO2
	C	Inverse of a matrix, Gauss elimination and Gauss-Jordan elimination.			CO2
	Unit 3	**Basic Algebra**			
	A	Sets, relations and functions.			CO3
	B	Basics of groups, cyclic groups.			CO3
	C	Subgroups, basics of Rings and Field.			CO3
	Unit 4	**Vector spaces**			
	A	Vector Space, linear dependence of vectors, basis, dimension.			CO4, CO5
	B	Linear transformations (maps), range and kernel of a linear map, rank and nullity.			CO4, CO5
	C	Inverse of a linear transformation, Matrix associated with a linear map.			CO4, CO5
	Unit 5	**Vector spaces (Prerequisite Module 2 –Matrices & Module-4 Vector spaces)**			
	A	Eigenvalues, Eigenvectors			CO6
	B	Symmetric, skew-symmetric, and orthogonal Matrices, Diagonalization			CO6
	C	Basic introduction of Inner product spaces, Gram-Schmidt orthogonalization.			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002. 2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.			
	Other References	1. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005. 2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008. 3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010. 4. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press,			

		Reprint 2005.	

COURSE OUTCOMES – PROGRAMME OUTCOMES MAPPING TABLE

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C142.1	3	3	2	2	3	1	-	-	-	1	1	1
C142.2	3	3	3	2	2	2	-	-	-	1	1	2
C142.3	3	3	2	2	2	1	-	-	-	1	1	1
C142.4	3	3	2	2	2	1	-	-	-	1	1	1
C142.5	3	3	2	2	2	1	-	-	-	1	1	2
C142.6	3	3	2	3	2	2	-	-	-	1	1	2

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: PHY 117, Semiconductor Physics

School: School of Basic Sciences and Research		**Batch: 2019-2023**	
Program: B.TECH .		**Current Academic Year: 2019-2020**	
Branch: CSE/EC/EEE		**Semester: II**	
1	Course Code	PHY 117	
2	Course Title	Semiconductor Physics	
3	Credits	3	
4	Contact Hours (L-T-P)	2-1-0	
	Course Status	Compulsory	
5	Course Objective	To make students proverbial with the fundamental concepts of Semiconductors materials and their real life applications for configuring various electronics devices.	
6	Course Outcomes	After the completion of this course, CO1: Students will learn the various fundamental theory of materials and concept of solid classification. CO2: Students will learn the fundamental concepts of mobility, conductivity, electrons and holes in an intrinsic semiconductors, Donor and Acceptor impurities (n-type and p-type semiconductor), Fermi levels etc. CO3: Students will gain knowledge about the formation of depletion region, barrier potential, Zener diode, Characteristics of Zener diode etc. CO4: Students will have a clear understanding of Coherent sources, interaction of radiation with matter (spontaneous and stimulated emission), Einstein's relation, population inversion and pumping, etc. CO5: Students will learn the concept of optical sources: Light emitting diode (construction, basic working principle), semiconductor laser (construction, basic working principle), and optical detectors. CO6: Student will be familiar with the essential concepts of Semiconductors materials technology and their applications in industries.	
7	Course Description	This course provides the basic foundation for understanding electronic semiconductor devices and their applications and limitations. It has introductory elements of various concept of material science. This course is essential for students who desire to specialize their engineering in Computer Sciences, Electronics, and Electronics and Electrical engineering.	
8	Outline Syllabus		CO Mapping
	Unit 1	**Physics ofSemiconductor**	

	A	Introduction, classical free electron theory (Lorentz-Drude theory and limitations), Quantum theory of free electron	CO1, CO6
	B	(Fermi energy, effect of temperature on Fermi-Dirac distribution) (qualitative analysis)	CO1
	C	Energy bands, Classification of Solids on the basis of energy band.	CO1
	Unit 2	**Transport phenomena in semiconductors**	
	A	Mobility, conductivity, electrons and holes in an intrinsic semiconductors, Donor and Acceptor impurities (n-type and p-type semiconductor)	CO2, CO6
	B	Fermi levels , carrier densities in semiconductor	CO2
	C	Concentration of electrons in conduction band and holes in valence band, Drift and diffusion current, Hall effect.	CO2
	Unit 3	**p-n Junction**	
	A	p-n junction, types of p-n junction (step-graded and Linearly-graded junction)	CO3
	B	formation of depletion region, barrier potential, Zener diode, Characteristics of Zener diode	CO3
	C	Avalanche and Zener breakdown, comparison of Zener diode and pn junction diode, concept of tunneling, I-V characteristics of tunnel diode.	CO3, CO6
	Unit 4	**Laser Physics**	
	A	Coherent sources, interaction of radiation with matter (spontaneous and stimulated emission), Einstein's relation	CO4
	B	population inversion and pumping, active components of laser, optical amplification or gain	CO4
	C	threshold condition for laser action, three and four level lasers, Ruby and He-Ne lasers.	CO4
	Unit 5	**Optoelectronic Devices**	
	A	optical sources: Light emitting diode (construction, basic working principle), semiconductor laser (construction, basic working principle)	CO5
	B	optical detectors: photodiode (working principle), p-i-n photodiode (working principle),	CO5, CO6
	C	Photovoltaic effect, p-n junction solar cell (basic working idea).	CO5, CO6
	Mode of Examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text books	Integrated Electronics- Millman - Halkias, Tata Mc Graw Hill	
	Other References	1. Semiconductor Devices Physics and Technology- S M Sze, John Wiley & Sons 2. Semiconductor Device Fundamentals- Robert F. Pierret Addison Wesley Longman. 3. Semiconductor Devices- Kanaan Kano, Pearson Education. 4. Basic Electronics by B.L Thareja 5. Principles of Electronics by V.K Mehta	

Schools: SET		**Batch :** 2019-20
		Current Academic Year: 2019-20
		Semester: 1st
1	Course Code	**ARP101**
2	Course Title	Communicative English-1
3	Credits	2
4	Contact Hours (L-T-P)	1-0-2
5	Course Objective	To minimize the linguistic barriers that emerges in varied socio-linguistic environments through the use of English. 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 while also uplifting their perception of themselves, giving them self-confidence and building positive attitude.
6	Course Outcomes	CO1 Learn to use correct sentence structure and punctuation as well as different parts of speech. CO2 Learning new words its application and usage in different contexts helpful in building meaning conversations and written drafts. Develop over all comprehension ability, interpret it and describe it in writing. Very useful in real life situations and scenarios. CO2 A recognition of one's self and abilities through language learning and personality development training leading up to greater employability chances. Learn to express oneself through writing while also developing positive perception of self. To be able to speak confidently in English CO3 To empower them to capitalise on strengths, overcome weaknesses, exploit opportunities, and counter threats. To ingrain the spirit of Positive attitude in students through a full length feature film followed by a storyboarding activity. Create a Self Brand, identity and self esteem through various interesting and engaging classroom activity CO4 Exposing students to simulataions and situations wherein students learn to describe people and situations and handle such situations effectively and with ease. Teaching students how to engage in meaningful dialogues and active conversational abilities to navigate through challenging situations in life and make effective conversations. CO12 Learn how to transform adverse beginnings into positive endings – through writing activities like story completion.
7	Course Description	The course is designed to equip students, who are at a very basic level of language comprehension, to communicate and work with ease in varied workplace environment. The course begins with basic grammar structure and pronunciation patterns, leading up to apprehension of oneself through

		written and verbal expression as a first step towards greater employability.	
8	Outline syllabus – ARP 201		
	Unit A	**Sentence Structure**	**CO Mapping**
	Topic 1	Subject Verb Agreement	CO1
	Topic 2	Parts of speech	
	Topic 3	Writing well-formed sentences	
	Unit B	**Vocabulary Building & Punctuation**	
	Topic 1	Homonyms/ homophones, Synonyms/Antonyms	CO1
	Topic 2	Punctuation/ Spellings (Prefixes-suffixes/Unjumbled Words)	CO1, CO1
	Topic 3	Conjunctions/Compound Sentences	CO1, CO2
	Unit C	**Writing Skills**	
	Topic 1	Picture Description – Student Group Activity	CO3
	Topic 2	Positive Thinking - Dead Poets Society-Full-length feature film - Paragraph Writing inculcating the positive attitude of a learner through the movie | SWOT Analysis – Know yourself	CO3, CO2, CO3
	Topic 3	Story Completion Exercise –Building positive attitude - The Man from Earth (Watching a Full length Feature Film)	CO2, CO3, CO4
	Unit D	**Speaking Skill**	
	Topic 1	Self-introduction/Greeting/Meeting people – Self branding	CO2, CO3
	Topic 2	Describing people and situations - To Sir With Love (Watching a Full length Feature Film)	CO3, CO4
	Topic 3	Dialogues/conversations (Situation based Role Plays)	CO2, CO4, CO4
9	Evaluations	*Class Assignments/Free Speech Exercises / JAM Group Presentations/Problem Solving Scenarios/GD/Simulations (60% CA and 40% ETE*	*N/A*
10	Texts & References | Library Links	• Blum, M. Rosen. *How to Build Better Vocabulary*. London: Bloomsbury Publication • Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press	

Observations:

1. A Single Consolidated Syllabus has now replaced the Previous Functional English Beginners -1 and Functional English Intermediate -1
2. Credits previously allocated to FEN 01 Lab Sessions have been dissolved
3. The Pearson Voice Labs have been completely eliminated

Syllabus: CSP 113: Programming for problem solving Lab

School: SET		**Batch: 2019-2023**	
Program: B.Tech.		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester: I**	
1	Course Code	CSP113	
2	Course Title	Programming for problem solving Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	6. Learn basic programming constructs –data types, decision structures, control structures in C 7. learning logic aptitude programming in c language 8. Developing software in c programming	
6	Course Outcomes	Students will be able to: CO1: Understand core concept of c Programming CO2: Implement Array and String CO3: Implement Functions CO4: Use Union and Structure CO5: Understand and implement Pointers	
7	Course Description	Programming for problem solving gives the Understanding of C programming and implement code from flowchart or algorithm	
8	Outline syllabus		CO Mapping
	Unit 1	**Logic Building**	**CO1**
		Draw flowchart for finding leap year	
		Write a c Program to Add Two Integers	
		Write a program to create a calculator	
	Unit 2	**Introduction to C Programming**	**CO2**
		Write a c program to convert length meter to cm	
		Write a c program to convert temp	
		Write a c program to swap two numbers	
	Unit 3	**Arrays and Functions**	**CO3**
		Write a c program to calculate the average using arrays	
		Write a c program to find the largest element of the array	
	Unit 4	**Pre-processors and Pointers**	**CO4**
		Write a c program to swap two values using pointers	
		Write a c program to find largest number from array using pointers	
	Unit 5	**User Defined Data Types and File Handling**	**CO5**

		Write a c program to store information of a student using structure			
		Write a c program to store information of a student using union			
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*			
	Other References	9. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004. 10. E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hill- 1999			

Course outline

This course implements array and pointer and Recursive applications. The course talks primarily about Array, string, functions, structure & union and Pointers etc.

Course Evaluation	
Attendance	None
Any other	CA judged on the practicals conducted in the lab , weightage may be specified
References	
Text book	Kernighan, Brian, and Dennis Ritchie. *The C Programming Language*
Other References	3. B.S. Gottfried - Programming With C - Schaum's Outline Series - Tata McGraw Hill 2nd Edition - 2004. 4. E. Balagurusamy - Programming in ANSI C - Second Edition - Tata McGraw Hill- 1999
Softwares	Turbo C

<table>
<tr><td colspan="2">School: SET</td><td colspan="3">Batch : 2019-23</td></tr>
<tr><td colspan="2">Program: B.TECH/BCA/BSc</td><td colspan="3">Current Academic Year: 2019-20</td></tr>
<tr><td colspan="2">Branch: CE</td><td colspan="3">Semester: I</td></tr>
<tr><td>1</td><td>Course Code</td><td>EVS112</td><td colspan="2">Course Name: Environmental Studies</td></tr>
<tr><td>2</td><td>Course Title</td><td colspan="3">Environmental Studies</td></tr>
<tr><td>3</td><td>Credits</td><td colspan="3">3</td></tr>
<tr><td>4</td><td>Contact Hours (L-T-P)</td><td colspan="3">3-0-0</td></tr>
<tr><td></td><td>Course Status</td><td colspan="3">Core</td></tr>
<tr><td>5</td><td>Course Objective</td><td colspan="3">This course is aimed to inculcate the environmental values translating into pro-conservation actions. Honorable Supreme Court of India has made it 'mandatory’ to introduce a basic course on environment at the undergraduate level</td></tr>
<tr><td>6</td><td>Course Outcomes</td><td colspan="3">CO1: Acquire the basic knowledge and understanding of problems of environment and need of sustainable development
CO2: Understand Importance of ecosystem and need for its conservation
CO3: Explore importance of various natural resources available and create awareness for conservation and reduction of exploitation
CO4: Assess importance of relationship between human culture, natural resources, biodiversity and need for its conservation
CO5: Identify causes and effects of environmental pollution on human and create awareness amongst the society.</td></tr>
<tr><td>7</td><td>Course Description</td><td colspan="3">Introduction, Ecosystem, Natural resources, Biodiversity and Conservation, Pollution</td></tr>
<tr><td>8</td><td colspan="3">Outline syllabus</td><td>CO Mapping/lecture hours</td></tr>
<tr><td></td><td>Unit 1</td><td colspan="2">Introduction to environmental studies</td><td>06</td></tr>
<tr><td></td><td>A</td><td colspan="2">Multidisciplinary nature of environmental studies; Human population and growth;</td><td rowspan="3">CO1</td></tr>
<tr><td></td><td>B</td><td colspan="2">Components of environment, Scope and importance</td></tr>
<tr><td></td><td>C</td><td colspan="2">Concept of sustainability and sustainable development. Environmental ethics</td></tr>
<tr><td></td><td>Unit 2</td><td colspan="2">Ecosystem</td><td>08</td></tr>
<tr><td></td><td>A</td><td colspan="2">What is ecosystem? Structure and function of ecosystem</td><td rowspan="3">CO2</td></tr>
<tr><td></td><td>B</td><td colspan="2">Energy flow in an ecosystem; food chain, food web and ecological succession</td></tr>
<tr><td></td><td>C</td><td colspan="2">Case study of following ecosystem: forest, grassland, desert, aquatic (pond, stream, lake, river, ocean, estuaries)</td></tr>
<tr><td></td><td>Unit 3</td><td colspan="2">Natural Resources: Renewable and non-Renewable resources</td><td>08</td></tr>
<tr><td></td><td>A</td><td colspan="2">Land use resources, land degradation, soil erosion; Deforestation (causes and impacts, effects on biodiversity and tribal population</td><td rowspan="2">CO3</td></tr>
<tr><td></td><td>B</td><td colspan="2">Water: use and overexploitation surface and ground water, flood,</td></tr>
</table>

		droughts, conflicts over water (international & inter state)	
	C	Heating of earth and circulation of air, air mass formation & precipitation; Energy resources: Renewable, nonrenewable, alternate energy source.	
	Unit 4	**Biodiversity and Conservation**	**09**
	A	Levels of biological diversity: genetic, species and ecosystem diversity.	CO4
	B	Threats to biodiversity; Conservation of biodiversity; natural reserves, wild life conflict.; Disaster management (flood, earthquake, cyclone &landslide)	
	C	Ecosystem and biodiversity services: ecological, economic, social, ethical, aesthetic and informational value. Environmental movements (Chipko, Silent valley, Bishnions of Rajasthan.)	
	Unit 5	**Environmental pollution**	**09**
	A	Environmental pollution: Types, causes, effects and control (air, water, soil, chemical & noise) carbon footprint	CO5
	B	Solid waste management; Environment laws: EPA, Air (pollution control) act, water (pollution control) act, Kyoto protocol, Montreal Protocol, CBD	
	C	Nuclear hazard, climate change, global warming, acid rain, ozone layer depletion.	
	Mode of examination	Theory+ 5 hours of field work	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text Books	1.Environmental Studies: R. Rajagopalan, Oxford University Press 2. Environmental Pollution: Causes, Effects & Control by K.C Agrawal 3. Environmental Sciences by Daniel B Botkin & Edward A Keller Publisher: John Wiley & Sons. 4. Environmental Studies by Dr. Suresh K Dhameja, Published by : S K Kataria & Sons New Delhi	
	Suggested references	1.Carson,R,2002.*Silent Spring*.Houghton Miffin Harcourt. 2.Groom,Martha J.Grey K.Meffe and Carl Ronald carroll.*Principles of conservation of Biology*. 3.Gleeson,B. and Low,N.1999.*Global Ethics and environment*,London 4.Pepper,I.L.,Gerba,C.P. & Brusseau,M.L.2011*Environment and Pollution Science*.	

CO and PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3

CO.1	1	2	1	-	-	2	3	2	-	-	-	-	1	-	1
CO.2	1	2	2	1	2	2	2	2	-	-	-	1	2	1	-
CO.3	2	2	2	1	2	2	2	2	1	1	-	1	1	1	-
CO.4	2	2	2	1	2	2	2	2	1	1	-	2	1	1	1
CO.5	2	2	3	-	1	2	2	2	1	1	-	2	1	1	1
CVL	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**-**	**1**	**1**	**1**	**1**

Syllabus: CSP 101:Introduction to Computer Science and Engineering

School: SET		**Batch : 2019-23**	
Program:B.Tech		**Current Academic Year: 2019-20**	
Branch: CSE		**Semester:I**	
1	Course Code	CSP101	Course Name
2	Course Title	Introduction to Computer Science and Engineering	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	UG	
5	Course Objective	1. To familiarize the students about the importance of Undergraduate course on Computer Science & Engineering. 2. To discuss recent developments in hardware and software environments. 3. To focus future application areas of Computer Science and Engineering. 4. To discuss various research and development options in Computer Science and Engineering.	
6	Course Outcomes	**The student should be able to:** CO1: Understand the technical aspects of Computer Science & Engineering Course. CO2: Perceive some knowledge about programming in various applications. CO3: Acquire basic understanding about computer networking and related technology. CO4: Enhance some fundamental knowledge of DBMS including application areas. CO5: Understand the current trends in computing in discovering wisdom/knowledge and future prediction.	
7	Course Description	This course focuses application areas of Computer Science and Engineering for students admitted in undergraduate program. The purpose of B. Tech. in Computer Science & Engineering is to be given through this course to students.	
8	Outline syllabus		CO Mapping
	Unit 1	**Hardware aspect of Computer Science & Engineering**	
	A	History of Computing Systems, Computer Basics	CO1

		and Computer Organization.	
	B	Computer Architecture, Introduction to various connecting devices.	
	C	Recent additions – IoT, Robotics and new alternate architectures.	
	Unit 2	**Programming Aspects**	
	A	Basics of Programming, Programming Paradigms, System Software versus Application Software.	CO2
	B	Hard Computing versus Soft Computing, Data Structures and Algorithms.	
	C	Computer Graphics, Multimedia, Computer Vision.	
	Unit 3	**Computer Networking**	
	A	Introduction to Networking, Various terminologies, Client Server Technology, Web Technology.	CO3
	B	Introduction to data/network security and current trends.	
	C	Concept of Cloud Computing and Virtualization, Real life applications.	
	Unit 4	**Database Management Systems**	
	A	Introduction to DBMS, DBMS versus File System, Relational DBMS.	CO4
	B	Information Processing and Retrieval	
	C	Big Data Analytics & Scientific Computing	
	Unit 5	**Artificial Intelligence**	
	A	Basics of Artificial Intelligence	CO5
	B	Basics of Pattern Recognition	
	C	Basics of Machine Learning	
	Mode of examination	Practical	
	Weightage Distribution	CA: 60% / MTE: NIL / ETE: 40%	
	Text book/s*	1. Introduction to Computer, Peter Norton, 7/e, 2019, Tata McGraw Hill Publishing.	
	Other References	2. Foundations of Computer Science, B A Forouzan& F Mosharraf, 2/e, 2008, Delmar Learning.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program

		Specific Outcomes (PSO)
1.	CO1: Understand the technical aspects of Computer Science &Engineering Course.	PO1, PO2, PO12, PSO4
2.	**CO2:**Perceive some knowledge about programming in various applications.	PO1, PO12, PSO1, PSO4
3.	**CO3:** Acquire basic understanding about computer networking and related technology.	PO1, PO2, PO12, PSO2, PSO4
4.	**CO4:**Enhance some fundamental knowledge of DBMS including application areas.	PO1, PO12, PSO2, PSO4
5.	**CO5:** Understand the current trends in computing in discovering wisdom/knowledge and future prediction.	PO1, PO6, PO8, PO12, PSO2, PSO4

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO 1	3	2	-	-	-	-	-	-	-	-	-	3	3	-	-	3	-
CO 2	3	2	-	-	-	-	-	-	-	-	-	3	-	3	-	2	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	3	-	2	-	3	-
CO 4	3	-	-	-	-	-	-	-	-	-	-	3	-	3	-	2	-
CO 5	3	-	-	-	-	2	-	2	-	-	-	3	-	3	-	3	-

B.Tech 1st year
Engineering Chemistry
Branches: CS/IT/ECE/EEE
(CHY111)

UNIT-1

Water: Analysis and its treatment

Water and water treatment: Drinking water standards, Water quality parameters and their measurement: pH (alkalinity and acidity – determination by titrimetry), Turbidity, Dissolved Oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), chloride, fluoride, oil and fats, hardness (definition and expression, estimation of hardness (EDTA method), nutrients (N, P, etc.), nitrate, dissolved metals. Municipal water treatment process - screening, sedimentation, flocculation; Coagulation, Filtration (Slow sand and rapid sand), disinfaction-chlorination.

UNIT-2

Spectroscopic studies of materials

Principles of spectroscopy and selection rules. Electronic spectroscopy: basic principle, 'Lamberts Beer's law,chromophore, effect of conjugation on chromophore and applications, Fluorescenceand its applications in medicine. Basic principle and applications of Nuclear magnetic resonance and magnetic resonance imaging spectroscopy.

UNIT-3

Electrochemistry, energy storage devices and corrosion

Electrochemistry: Redox reactions, Nernst Equation, relation of e.m.f. with thermodynamic functions (ΔH, ΔF and Δ S). Electrochemical cells- Galvanic cells and Concentration cell, electrode potentials and its relevance to oxidation and reduction, measurement of EMF under standard conditions, determination of pH using Hydrogen electrode, primary battery: dry cells, secondary battery: Lead acid accumulator and Li Ion, fuel cells: H_2-O_2.

Corrosion: Types of corrosion, mechanism of Electrochemical corrosion, galvanic corrosion and protection against electrochemicalcorrosion.

UNIT-4

Chemistry of materials: Structure, properties and application of carbon materials such as diamond, graphite, fullerenes, graphene. Liquid crystals: classification, Molecular ordering, identification, polymeric liquid crystals, and application of liquid crystals: displays and thermography. Organic and inorganic semiconductors.Basic concepts of Conducting polymer, types,p-doping, n-doping, comparison with metallic conductors, examples and applications. Biodegradable polymers: Basic information with common examples Polyglycolic acid (PGA), Polyhydroxy butyrate (PHB), Polyhydroxybutyrates-co-beta hydroxyl valerate(PHBV), Polycaprolactone(pcl).

UNIT-5

Nano science and technology

Introduction to nanoscience and technology, lithography, soft lithography,Dip pen nanolithography, CNT's, bio-nanoinformation, application in microelectronics and in memory devices.

Reference books:

(i)University chemistry, by B. H. Mahan
(ii) Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
(iii)Fundamentals of Molecular Spectroscopy, by C. N. Banwell
(iv)Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
(v) Physical Chemistry, by P. W. Atkins
(vi)Introduction to nanotechnology: C.P poole,Jr. F.J. Owens, willeyinterscience 2003.
(vii)Nanotechnology, science, innovation and opportunity, LE foster, Pearson education 2007.

Syllabus: CSE 114:Application based programming in Python

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester: II**	
1	Course Code	CSE114	Course Name
2	Course Title	Application Based Programming in Python	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Compulsory	
5	Course Objective	Emphasis is placed on procedural programming, algorithm design, and language constructs common to most high-level languages through Python Programming.	
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1. Select decision-making and looping structures in programming. CO2. Apply Modular programming approach using methods and functions. CO3. Show the use of Python lists, tuples and dictionary. CO4. Incorporate object-oriented programming concept in programming. CO5: Use of python packages in different applications.	
7	Course	Python is a language with a simple syntax, and a powerful set of	

	Description	libraries. It is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience. We cover data types, control flow, object-oriented programming.			
8	Outline syllabus				CO Mapping
	Unit 1	**Introduction**			
	A	History, Python Environment, Variables, Data Types, Operators.			CO5
	B	**Conditional Statements:** If, If- else, Nested if-else. **Looping:** For, While, Nested loops.			CO1,CO5
	C	**Control Statements:** Break, Continue, And Pass. Comments			CO1,CO5
	Unit 2	**List, Tuple and Dictionaries**			
	A	**Lists and Nested List:** Introduction, Accessing list, Operations, Working with lists, Library Functionand Methods with Lists.			CO3
	B	**Tuple:** Introduction, Accessing tuples, Operations, Working, Library Functions and Methods with Tuples.			CO3
	C	**Dictionaries :**Introduction, Accessing values in dictionaries, Working with dictionaries, Library Functions			CO3
	Unit 3	**Functions and Exception Handling**			
	A	**Functions:** Defining a function, Calling a function, Types of functions, Function Arguments			C02,CO5
	B	Anonymous functions, Global and local variables			C02,CO5
	C	**Exception Handling**: Definition Exception, Exception handling Except clause, Try? finally clause			CO2,CO5
	Unit 4	**OOP and File Handling**			
	A	**OOPs concept** : Class and object, Attributes, Abstraction, Encapsulation, Polymorphism and Inheritance			C04
	B	Static and Final Keyword, Access Modifiers and specifiers, scope of a class			CO4
	C	User Defined Exceptions			CO4
	Unit 5	**Module and Applications**			
	A	**Modules:** Importing module, Math module, Random module			C02,CO5
	B	Matplotlib, Packages			C02,CO5
	C	**Applications: Searching Linear Search, Binary Search. Sorting: Bubble Sort**			C02,CO5
	Mode of examination	Theory			
	Weightage	CA	MTE	ETE	

	Distribution	30%	20%	50%	
	Text book/s*	3. The Complete Reference Python, Martin C. Brown, McGraw Hill			
	Other References	1. Introduction to computing in problem solving using Python, E Balahurusamy, McGraw Hill 2. Introduction to programming using Python, Y. Daniel Liang, Pearson 3. Mastering Python, Rick Van Hatten, Packet Publishing House 4. Starting out with Python, Tony Gaddis, Pearson			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1. Apply decision and repetition structures in program design.	PO1,PO5,PO9,PO11,PSO3
2.	CO2. Implement methods and functions to improve readability of programs.	PO1,PO2,PO3,PO4,PO5,PO9,PO11,PSO1, PSO2,PSO3,PSO4,PSO5
3.	CO3. Demonstrate the use of Python lists, tuples and dictionaries	PO1,PO2,PO3,PO4,PO5,PO9,PO11,PSO1, PSO2,PSO3,PSO4,PSO5
4.	CO4. Describe and apply object-oriented programming methodology.	PO1,PO2,PO3,PO4,PO5,PO9,PO11,PSO1, PSO2,PSO3,PSO4,PSO5
5.	CO5. Apply top-down concepts in algorithm design.	PO1PO3,PO4,PO5,PO9,PO11,PSO1, PSO2,PSO3,PSO4,PSO5
6.	CO6. Write Python programs to illustrate concise and efficient algorithms	PO1,PO4,PO5,PO9,PO11,PSO1, PSO2,PSO3,PSO4,PSO5

PO and PSO mapping with level of strength for Course Name Application Based Programming in Python **(Course Code CSE 114)**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	1	3	2	2	1	-	-	-	1	-	1	-	2	2	1	2	3
CO2	3	3	3	3	3	-	-	-	3	-	3	-	3	3	3	3	3
CO3	3	3	3	3	2	-	-	-	3	-	2	-	3	3	2	2	2
CO4	2	2	2	1	2	-	--	-	2	-	1	-	2	1	1	2	1
CO5	2	3	2	1	2				1		2		1	2	2	1	1
CO6	1	2	1	2	1				1		1		3	2	2	1	2

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: CSE		**Semester: II**
1	Course Code	**MTH 145**
2	Course Title	**Probability and Statistics**
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.
6	Course Outcomes	CO1: Explain the concept of probability and Random Variable. (K2,K3, K4) CO2: Explain the concept of distribution functions, densities andprobability distributions; illustrate discrete and continuous probability distributions. (K1, K2, K3, K4) CO3: Describe the concept of moments, skewness and Kurtosis; evaluatecorrelation and regression – Rank correlation; discuss bivariate distributions and their properties . (K1, K2, K5) CO4: Discuss the basic of Curve fitting by the method of least squares; evaluate straight lines, second degree parabolas and more general curves. (K1, K2, K5) CO5: Describe and use the concepts test of significance: Large sample test for single proportion, difference of proportions; calculate single mean, difference of means, and difference of standard deviations. (K1,K2,K3) CO6: Explain the basic concepts of tests of small samples- Student's T test, Chi-square test for goodness of fit, and evaluate the result. (K2, K4, K5)
7	Course Description	This course is an introduction to the fundamental of Mathematics. The primary objective of the course is to develop the basic understanding of statistics including measures of central tendency, correlation and regression, statistical methods of data sampling, probability and random variables and various discrete andcontinuous probability distributions and their properties.

8	**Outline syllabus :Probability and Statistics**		**CO Mapping**
	Unit 1	**Basic Probability**	

	A	Probability spaces, conditional probability, Bayes' rule.	CO1
	B	Discrete random variables, Independent random variables	CO1
	C	Expectation of Discrete Random Variables, Chebyshev's Inequality	CO1
	Unit 2	**Discrete and Continuous Probability Distributions**	
	A	Discrete Probability distributions: Binomial, Poisson.	CO2
	B	Continuous random variables and their properties, distribution functions and densities.	CO2
	C	Normal, exponential and gamma distribution.	CO2
	Unit 3	**Statistics**	
	A	Moments, skewness and Kurtosis.	CO3
	B	Correlation and regression – Rank correlation.	CO3
	C	Bivariate distributions and their properties.	CO3
	Unit 4	**Applied Statistics**	
	A	Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.	CO4, CO5
	B	Test of significance: Large sample test for single proportion,	CO4, CO5
	C	Difference of proportions, single mean, difference of means, and difference of standard deviations.	CO4, CO5
	Unit 5	**Testing Hypothesis**	
	A	Test for single mean, difference of means	CO6
	B	test for ratio of variances	CO6
	C	Chi-square test for goodness of fit and independence of attributes	CO6
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint). 3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.	
	Other References	1. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. 2. B.S. Grewal, Higher Engineering Mathematics,	

		Khanna Publishers, 35th Edition, 2000. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.	

COURSE OUTCOMES – PROGRAMME OUTCOMES MAPPING TABLE

PO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
C145.1	3	3	2	2	3	1	-	-	-	1	1	1
C145.2	3	2	3	2	2	2	-	-	-	1	1	2
C145.3	3	3	2	2	2	1	-	-	-	1	1	1
C145.4	3	2	2	2	2	1	-	-	-	1	1	1
C145.5	3	3	2	2	2	1	-	-	-	1	1	2
C145.6	3	3	2	3	2	2	-	-	-	1	1	2

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Schools: SBS		**Batch :** 2019-2023 **Current Academic Year:** 2019-20 **Semester:** 2nd (Second)
1	Course Code	**ARP102**
2	Course Title	Communicative English -2
3	Credits	2
4	Contact Hours (L-T-P)	1-0-2
5	Course Objective	To Develop LSRW skills through audio-visual language acquirement, creative writing, advanced speech et al and MTI Reduction with the aid of certain tools like texts, movies, long and short essays.
6	Course Outcomes	**CO1** Move from primary self-assessment to larger goal and vision statement realisation with the help of feature length films as enablers and multimedia as language facilitators. **CO2** To develop a positive attitude through written expression of positive thought process and outlook with the help of writing activities like story completion et al. **CO3** Learn advanced writing skills in English like full length essays et al. **CO4** Master the science of speech and correct pronunciation through the accent-neutralisation program followed by reading sessions applying the lessons learnt.
7	Course Description	The course takes the learnings from the previous semester to an advanced level of language learning and self-comprehension through the introduction of audio-visual aids as language enablers. It also leads learners to an advanced level of writing, reading, listening and speaking abilities, while also reducing the usage of L1 to minimal in order to increase the employability chances.
8	Outline syllabus – ARP 202	

	Unit A	**Acquiring Vision, Goals and Strategies through Audio-visual Language Texts**	**CO Mapping**
	Topic 1	Pursuit of Happiness / Goal Setting & Value Proposition in life	CO1
	Topic 2	12 Angry Men / Ethics & Principles	
	Topic 3	The King's Speech / Mission statement in life | strategies & Action Plans in Life	
	Unit B	**Creative Writing**	
	Topic 1	Story Reconstruction - Positive Thinking	CO2
	Topic 2	Theme based Story Writing - Positive attitude	
	Topic 3	Learning Diary Learning Log – Self-introspection	

	Unit C	**Writing Skills 1**	
	Topic 1	Precis	CO3
	Topic 2	Paraphrasing	
	Topic 3	Essays (Simple essays)	
	Unit D	**MTI Reduction/Neutral Accent through Classroom Sessions & Practice**	
	Topic 1	Vowel, Consonant, sound correction, speech sounds, Monothongs, Dipthongs and Tripthongs	CO4
	Topic 2	Vowel Sound drills , Consonant Sound drills, Affricates and Fricative Sounds	
	Topic 3	Speech Sounds | Speech Music| Tone | Volume| Diction |Syntax |Intonation | Syllable Stress |	
	Unit E	**Gauging MTI Reduction Effectiveness through Free Speech**	
	Topic 1	Jam sessions	*N/A*
	Topic 2	Extempore	
	Topic 3	Situation-based Role Play	
9	Evaluations	*Class Assignments/Free Speech Exercises / JAM Group Presentations/Problem Solving Scenarios/GD/Simulations (60% CA and 40% ETE*	*N/A*
10	Texts & References | Library Links	• Wren, P.C.&Martin H. *High English Grammar and Composition*, S.Chand& Company Ltd, New Delhi. • Blum, M. Rosen. *How to Build Better Vocabulary*. London: Bloomsbury Publication • Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press. The Luncheon by W.Somerset Maugham - http://mistera.co.nf/files/sm_luncheon.pdf	

Syllabus: CSP 114:Application based programming in Python Lab

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch:All		**Semester: II**	
1	Course Code	CSP114	
2	Course Title	Application Based Programming in Python Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	Emphasis is placed on procedural programming, algorithm design, and language constructs common to most high level languages through Python Programming.	
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1. Apply decision and repetition structures in program design. CO2. Implement methods and functions to improve readability of programs. CO3. Demonstrate the use of Python lists, tuples and dictionaries CO4. Describe and apply object-oriented programming methodology. CO5. Apply top-down concepts in algorithm design. CO6. Write Python programs to illustrate concise and efficient algorithms	
7	Course Description	Python is a language with a simple syntax, and a powerful set of libraries. It is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience. We cover data types, control flow, object-oriented programming.	
8	Outline syllabus		CO Mapping
	Unit 1	**Practical based on conditional statements and control structures**	
		1. Program to implement all conditional statements 2. Program to implement different control structures	CO1,C06
	Unit 2	**Practical related to List, Tuples and dictionaries**	
		1. Program to implement operations on lists 2. Program to implement operations on Dictionary **3.** Program to implement operations on Tuple	CO3,CO6
	Unit 3	**Practical related to Functions and Exception Handling**	
		1. Program to implement Exception Handling **2.** Program to use different functions	CO2,CO6
	Unit 4	**Practical related to Object Oriented Programming**	
		Program to use object oriented concepts like inheritance, overloading polymorphism etc. Program for file handling	CO4,CO6
	Unit 5	**Practical related to Modules and Applications**	
		Program to use modules and package	CO2,CO5,CO6

		Program to implement searching and sorting			
	Mode of examination	Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	4. The Complete Reference Python, Martin C. Brown, McGraw Hill			
	Other References	5. Introduction to computing in problem solving using Python, E Balagurusamy, McGraw Hill 6. Introduction to programming using Python, Y. Daniel Liang, Pearson 7. Mastering Python, Rick Van Hatten, Packet Publishing House 8. Starting out with Python, Tony Gaddis, Pearson			

Syllabus: CSE 247, Computer organization and architecture

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE/IT		**Semester: III**	
1	Course Code	CSE247	Course Name
2	Course Title	Computer Organization and Architecture	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Compulsory	
5	Course Objective	To impart an understanding of the internal organization and operations of a computer and to introduce the concepts of processor logic design and control logic design.	
6	Course Outcomes	Upon successful completion of this course, the student will be able to: **CO1:**Identify the basic structure and functional units of a digital computer. **CO2:**Study the design of arithmetic and logic unit and implementation of fixedpoint and floating-point arithmetic operations **CO3:**Understand basic processing unit and organization of simple processor including instruction sets, instruction formats and various addressing modes **CO4:**Study the two types of control unit techniques **CO5:**Describe hierarchical memory systems including cache memories and select appropriate interfacing standards for I/O devices.	
7	Course Description	This course discusses the basic structure of a digital computer and used for understanding the organization of various units such as control unit, Arithmetic and Logical unit and Memory unit and I/O unit in a digital computer.	
8	Outline syllabus		CO Mapping
	Unit 1	**Computer Organization and Design**	
	A	Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration. Register bus and memory transfer	CO1
	B	Register transfer Language, Registertransfer, Bus & memory transfer, Logic micro operations, Shift micro operation.	CO1
	C	Adder-Subtractor- Incrementor, Arithmetic unit, Logic unit.	CO1
	Unit 2	**Computer Arithmetic**	
	A	Representation of numbers in 1's and 2's complement, Addition and subtractionofsigned numbers.	CO1, CO2
	B	Binary Multiplier, Multiplication: Signed operand multiplication, Booth algorithm	CO1, CO2
	C	Floating point arithmetic representation: addition and subtraction.	CO1, CO2
	Unit 3	**Processor Organization**	
	A	General register organization, stack organization	CO3
	B	Instruction set architecture of a CPU - registers, Instruction types, formats, instruction execution cycle	CO3

	C	Addressing modes, RISC/CISC			CO3
	Unit 4	**Control Unit**			
	A	Introduction to CPU design, Instruction interpretation and execution, Micro-operation and their register transfer language (RTL) specification			CO3, CO4
	B	Hardwired control CPU design			CO3, CO4
	C	Microprogrammed control CPU design			CO3, CO4
	Unit 5	**Memory and I/O**			
	A	RAM/ROM/Flash memory, Designing Memory System using RAM and ROM chips			CO1, CO5
	B	Cache memory: Memory hierarchy, performance Considerations, mapping techniques			CO1, CO5
	C	Input Output: Isolated vs. Memory mapped I/O, Programmed I/O, Interrupt driven I/O, Direct Memory Access			CO1, CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. M. Morris Mano, Computer System Architecture, Pearson			
	Other References	1. C. Hamacher, Z. Vranesic and S. Zaky, "Computer Organization", McGrawHill, 2002. 2. W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India, 2002. 3. D. A. Patterson and J. L. Hennessy, "Computer Organization and Design - The Hardware/Software Interface", Morgan Kaufmann,1998. 4. J.P. Hayes, "Computer Architecture and Organization", McGraw-Hill, 1998.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1. Identify the basic structure and functional units of a digital computer.	PO1, PO2, PO3, PO6, PO12, PSO5
2.	CO2. Study the design of arithmetic and logic unit and implementation of fixedpoint and floating-point arithmetic operations	PO1, PO2, PO3, PO6, PO12, PSO5
3.	CO3. Understand basic processing unit and organization of simple processor including instruction sets, instruction formats and various addressing modes	PO1, PO2, PO3, PO6, PO12, PSO5
4.	CO4. Study the two types of control unit	PO1, PO2, PO3, PO4, PO6, PO12, PSO4,

	techniques	PSO5
5.	CO5. Describe hierarchical memory systems including cache memories and select appropriate interfacing standards for I/O devices	PO1, PO2, PO3, PO6, PO12, PSO4, PSO5

PO and PSO mapping with level of strength for Course Name Computer Organization and Architecture **(Course Code CSE 247)**

CSE247	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	1	1	-	-	2	-	-	-	-	-	2	-	-	-	-	2
	CO2	3	3	3	-	-	3	-	-	-	-	-	3	-	-	-	-	3
	CO3	3	2	3	-	-	2	-	-	-	-	-	3	-	-	-	-	3
	CO4	3	2	2	-	-	1	-	-	-	-	-	3	-	-	-	3	2
	CO5	3	3	3	-	-	2	-	-	-	-	-	3	-	-	-	3	2

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

School: SET		**Batch :** 2019-23 **Current Academic Year:** 2019-20 **Semester:** 3rd
1	Course Code	**ARP203**
2	Course Title	Logical Skills Building and Soft Skills
3	Credits	2
4	Contact Hours (L-T-P)	1-0-2
5	Course Objective	To enhance holistic development of students and improve their employability skills. To provide a 360 degree exposure to learning elements of Business English readiness program, behavioural traits, achieve softer communication levels and a positive self-branding along with augmenting numerical and altitudinal abilities. To step up skill and upgrade students' across varied industry needs to enhance employability skills. By the end of this semester, a student will have entered the threshold of his/her 1st phase of employability enhancement and skill building activity exercise.
6	Course Outcomes	CO1: *Know Yourself - A proven Student engagement model to assess individual skill level* CO2: *To identify a student's TNI/TNA (Training Need Identification and Analysis) data* CO3: *To make students self-aware | raise self-esteem & effectiveness* CO4: *To build positive thinking in students and reinforce positive attitude building* CO5: *How to build positive emotional competence in students | GOAL Setting and SMART Goals* CO6: *Enhancing LSRW (Listening Speaking Reading Writing) | Verbal Abilities - 1* CO7: *Understanding AMCAT + ELITMUS Study patterns for Quantitative aptitude and Logical | Analytical Reasoning*
7	Course Description	This Level 1 blended training approach equips the students for Industry employment readiness and combines elements of soft skills and numerical abilities to achieve this purpose.
8	Outline syllabus – ARP 203	

	Unit 1	**BELLS (Building Essential Language and Life Skills)**	**CO Mapping**
	A	Subject Verb Agreement | One word substitution, writing well formed sentences, tense, preposition,	*CO1, CO2,*
	B	Idioms, phrases, spotting the errors , root verb error, prefix & suffix	*CO3*
	C	*Know Yourself*: Techniques of Self Awareness | Self Esteem & Effectiveness| Building Positive Attitude | Building Emotional Competence	*CO4, CO5,CO6*
	D	Positive Thinking & Attitude Building | Goal Setting and SMART Goals – Milestone Mapping | Enhancing L S R W G and P (Listening Speaking Reading) | Verbal Abilities - 1	*CO5, CO6*
	Unit 2	**Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical**	

	A	Syllogism | Letter Series | Coding, Decoding , Ranking & Their Comparison Level-1	*CO7*
	B	Number Puzzles	*CO7*
	C	Selection Based On Given Conditions	*CO7*
	Unit 3	**Quantitative Aptitude**	
	A	Number Systems Level 1 | Vedic Maths Level-1	*CO7*
	B	Percentage ,Ratio & Proportion | Mensuration - Area & Volume |Algebra	*CO7*
	Weightage Distribution	*Class Assignment/Free Speech Exercises / JAM – 60% | Group Presentations/Mock Interviews/GD/ Reasoning, Quant & Aptitude – 40%*	
	Text book/s*	*Wiley's Quantitative Aptitude-P Anand |* ***Quantum CAT - Arihant Publications | Quicker Maths- M. Tyra |*** *Power of Positive Action (English, Paperback, Napoleon Hill) | Streets of Attitude (English, Paperback, Cary Fagan, Elizabeth Wilson) The 6 Pillars of self-esteem and awareness - Nathaniel Brandon | Goal Setting (English, Paperback, Wilson Dobson*	

BTY223 INTRODUCTION TO BIOLOGY FOR ENGINEERS

1	Course number	**BTY223**	
2	Course Title	**Introduction to Biology for Engineers**	
3	Credits	1	
4	Contact Hours (L-T-P)	2-0-0	
5	Course Objective	To provide a foundation in biotechnology with engineering of living systems and to apply various tools of traditional engineering fields such as mechanical, material, electrical and chemical to understand and solve biomedical and biological problems and harness potential of living systems for the benefit of human mankind.	
6	Course Outcomes	After successfully completion of this course students will be able to: 1. Explain the scope, concepts, and terminology of biotechnology; 2. Investigate and explain current events and advances in biotechnology; 3. Discuss About the interdisciplinary nature of Biotechnology 4. Describe techniques involving the manipulation of DNA 5. Explore career opportunities in biotechnology	
7	Outline syllabus:		
7.01	XXXNNN.A	**Unit A**	**UNIT I: Introduction to Biotechnology**
7.02	XXXNNN.A1	Unit A Topic 1	History and origin of Biotechnology
7.03	XXXNNN.A2	Unit A Topic 2	Traditional and Modern Biotechnology
7.04	XXXNNN.A3	Unit A Topic 3	Important events in history of biotechnology.
7.05	XXXNNN.B	**Unit B**	**UNIT II: Scope of Biotechnology**
7.06	XXXNNN.B1	Unit B Topic 1	Areas of Biotechnology
7.07	XXXNNN.B2	Unit B Topic 2	Medicine and health care
7.08	XXXNNN.B3	Unit B Topic 3	Agriculture and industrial biotechnology
7.09	XXXNNN.C	**Unit C**	**UNIT III: Biotechnology as interdisciplinary science**
7.10	XXXNNN.C1	Unit C Topic 1	Introduction to Bioinformatics and Computational Biology
7.11	XXXNNN.C2	Unit C Topic 2	Role of Biotechnology in maintaining sustainable environment
7.12	XXXNNN.C3	Unit C Topic 3	Basics of Convergence of biotechnology and electronics
7.13	XXXNNN.D	**Unit D**	**UNIT IV: Basics of Gene Technology**
7.14	XXXNNN.D1	Unit D Topic 1	DNA as blue print of life
7.15	XXXNNN.D2	Unit D Topic 2	Introduction to rDNA Technology
7.16	XXXNNN.D3	Unit D Topic 3	Transgenesis and Cisgenesis
7.17	XXXNNN.E	**Unit E**	**UNIT V: Current advances in Biotechnology**
7.18	XXXNNN.E1	Unit E Topic 1	Introduction to Stem cells,
7.19	XXXNNN.E2	Unit E Topic 2	Tissue engineering and

7.20	XXXNNN.E3	Unit E Topic 3	Gene therapy
8	Course Evaluation		
8.1	Course work: 30% marks		
8.11	Attendance	None	
8.12	Assignments	5 marks	
8.13	Quizzes	20 marks	
8.14	Presentations	5 marks	
8.15	Any other	None	
8.16	MTE	20 marks	
8.18	End-term examination: 50 marks		
8.19	References		
8.20	Text book	1. Smith J. E., Biotechnology, 3rd Edition, Cambridge University Press (2006)	
8.21	Other References	1. Molecular biology of the Gene (4th Edition),J .D. Watson, N. H. Hopkins, J. W. Roberts,J.A. Steitz and A.M. 2. Ravi, Indu, Baunthiyal, Mamta, Saxena, Jyoti. Advances in Biotechnology, Springer 2014.	

Mapping of Outcomes vs. Topics

Outcome no. → Syllabus topic↓	1	2	3	4	5	6	7	8	9
XXXNNN.A	X								
XXXNNN.A1	X								
XXXNNN.A2	X								
XXXNNN.A3	X								
XXXNNN.B		X							
XXXNNN.B1		X							
XXXNNN.B2		X							
XXXNNN.B3		X							
XXXNNN.C			X	X	X				
XXXNNN.C1			X						
XXXNNN.C2				X					
XXXNNN.C3					X				
XXXNNN.D						X	X		
XXXNNN.D1						X			
XXXNNN.D2							X		
XXXNNN.D3							X		
XXXNNN.E								X	X
XXXNNN.E1								X	
XXXNNN.E2									X
XXXNNN.E3									X

Syllabus: CSE242, Data Structures

School: SET		**Batch :**2019-23
Program: B.Tech.		**Current Academic Year:** 2019-20
Branch:CSE/IT		**Semester:**III
1	Course Code	CSE242
2	Course Title	Data Structures
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Core
5	Course Objective	1. Learn the basic concepts of Data Structures and algorithms. 2. Design and Implementation of Various Basic and Advanced Data Structures. 3. Learn the concepts of various searching, Sorting and Hashing Techniques. 4. Choose the appropriate data structures and algorithm design method for a specified application.
6	Course Outcomes	CO1: Implement operation like traversing, insertion, deletion, searching etc. on various data structures. CO2: Evaluate algorithms and data structures in terms of time and memory complexity. CO3 Understand the application of linear data structure(s) to solve various problems CO4: Understand the application of non linear data structure(s) to solve various problems. CO5: Implement and know when to apply standard algorithms for searching and sorting. CO6: Choose the most appropriate data structure(s) for a given problem
7	Course Description	This course starts with an introduction to data structures with its classification, efficiency of different algorithms, array and pointer based implementations and Recursive applications. As the course progresses the study of Linear and Non-Linear data structures are studied in details. The course talks primarily about Linked list, stacks, queue, Tree structure, Graphs etc. This Course also deals with the concept of searching, sorting and hashing methods.

8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Data Structure – Definition, Operations and Applications, Abstract Data Types, Algorithm – Definition, Introduction to Complexity, Big OH notation, Time and Space tradeoffs.	CO1
	B	Dynamic Memory Allocation(Malloc, calloc, realloc, free), Recursion – Definition, Examples- Tower of Hanoi problem, Fibonacci Series.	CO1

	C	Arrays: Implementation of One Dimensional Arrays, Multidimensional Arrays, Pointer Arrays. Applications of Arrays, Address Calculation, Matrix Operations, Sparse martices	CO1
	Unit 2	**Linked List**	
	A	Concept of Linked List, Garbage Collection, Overflow and Underflow, Array Implementation and Dynamic Implementation of Singly Linked Lists	CO2
	B	Array Implementation and Dynamic Implementation of Doubly Linked List, Circularly Linked List	CO3
	C	Operations on a Linked List- Insertion, Deletion, Traversal, Polynomial Representation and Addition	CO2
	Unit 3	**Stack and Queue**	
	A	Stacks: Definitions, Primitive operations, Application of stacks – Conversion of Infix Expression to Postfix form, Evaluation of Postfix Expressions	CO3
	B	Queues: Definition, Primitive Operations, Implementation of Circular Queues, Priority Queues	CO3
	C	Deques, Application of Queues. Implementation - Linked Stacks, Linked Queues.	CO3
	Unit 4	**Tree and Graphs**	
	A	Trees: Terminologies, Binary tree, Representation, Applications, Binary search Tree – Operations on Binary Search Trees (Traversing, Insertion, deletion etc.), Binary Search Algorithm, AVL Tree	CO4, CO6
	B	Graph: Terminology, Representation, Traversals- Depth First Search, Breadth First Search.	CO4, CO6
	C	Graph Applications – Minimum Spanning Trees – Prim's and Kruskal's Algorithms	CO4, CO6
	Unit 5	**Searching, Sorting and Hashing**	
	A	Implementation and Analysis - Linear search, Binary Search	CO5
	B	Implementation and Analysis- Bubble Sort, Insertion Sort, Selection Sort, Tree sort	CO5
	C	Hashing: Concepts and Applications, Hash Functions, Collisions, Methods of Resolving Collisions	CO5
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH	
	Other References	1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI 2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication 3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill 4. R. Kruse etal, "Data Structures and Program Design in	

		C", Pearson Education 5. G A V Pai, "Data Structures and Algorithms", TMH	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	Handle operation like traversing, insertion, deletion, searching etc. on various data structures.	PO1, PO3, PSO3
2.	Evaluate algorithms and data structures in terms of time and memory complexity.	PO1, PO2, PO3, PSO1, PSO2
3.	Understand the application of linear data structure(s) to solve various problems	PO2, PO3, PO4, PO9, PSO1, PSO2
4.	Understand the application of non linear data structure(s) to solve various problems.	PO3, PO9, PSO1, PSO2
5.	Implement and know when to apply standard algorithms for searching and sorting.	PO1, PO2, PO9, PSO1,PSO3
6.	Choose the most appropriate data structure(s) for a given problem	PO1, PO2, PO4, PO9, PSO1

Course Code	Course Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	Data Structures Using C																	
	CO1	2		1										2		1		
	CO2		2		1					2				3	1			
CSE 242	CO3	3	3	2						3					3			
	CO4	3	3	2	3					3					3			
	CO5		1	2												2		
	CO6			3	3	2										3		

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: CSE 243, Object Oriented Programming Using JAVA

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch:CSE		**Semester:III**	
1	Course Code	CSE243	Course Name
2	Course Title	Object Oriented Programming Using JAVA	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	UG	
5	Course Objective	**1.**GainknowledgeaboutbasicJavalanguagesyntaxandsemanticstowriteJavaprogramsand use concepts such as variables, conditional and iterative execution methods etc. **2.** Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms. **3.** Understand the principles of inheritance, packages and interfaces.	
6	Course Outcomes	Students will be able to: CO1. Identify classes, objects, members of a class and relationships among them needed for a specific problem. CO2. Write Java programs using OOP principles and demonstrate the concepts of polymorphism and inheritance CO3.Create Java programs to implement error-handling techniques using exception handling. CO4. Construct a professional looking package for business project using java doc.	
7	Course Description	Basic *Object Oriented Programming* (*OOP*) concepts, including objects, *classes*, methods, parameter passing, information hiding, inheritance and polymorphism are introduced and their implementations *using Java* are discussed.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Object Oriented Paradigm**	
	A	History, The meaning of Object Orientation, Features of Java, OOPs concepts object identity,	CO1, CO2
	B	Encapsulation, information hiding, polymorphism inheritance Java virtual machine,	CO1, CO2
	C	Byte Code, Architecture of JVM, Class Loader Execution Engine, Garbage collection.	CO1, CO2,CO3
	Unit 2	**Introduction to Java**	
	A	Java development Kit(JDK),Introduction to IDE for java development, Setting java environment(steps for path and CLASSPATH setting).	CO1, CO2,CO4
	B	Constants, Variables, Data Types, Operators, Expressions.	CO1, CO2,CO4

	C	Decision Making Branching, Loops, command line argument.			CO1, CO2,CO4
	Unit 3	**Class & Object**			
	A	Arrays, Type conversion & casting, Input from keyboard, Classes Objects.			CO1,CO2,CO3
	B	Methods Method overloading, Constructors, Constructors overloading.			CO1,CO2,CO3
	C	static keyword, Introducing Access Control, String handling.			CO4,CO2
	Unit 4	**Inheritance, package and Interface Inheritance Implementation**			
	A	Multilevel Hierarchy, Overriding methods, Polymorphism, use of this and super, Constructor call in inheritance Abstract class and method,			CO1,CO2,CO3
	B	Final class, method and variable, Implementing Interface, Concept of multiple inheritance in Java, Wrapper class			CO1,CO2,CO3
	C	Packages: User defined packages, built-in packages (java.lang package), Access modifiers.			CO1,CO2,CO3
	Unit 5	**Exception and Multithreading**			
	A	Input/output: Exploring java.io, File,StreamClassesByte Stream Classes and Character stream Classes,.			CO1,CO2,CO3
	B	reading and writing in file, Introduction to Exception Handling, Introduction to try, catch, Finally , throw and throws, Checked and Unchecked exceptions, User define exception			CO1,CO2,CO3
	C	Java's Built-in Exception Chained Exception, Introduction to Multithreading: Creating thread using Runnable interface and Thread class, Thread life cycle, Thread priorities, sleep method.			CO1,CO2,CO3
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1.Schildt H, "The Complete Reference JAVA2", TMH			
	Other References	1. Balagurusamy E, "Programming in JAVA", TMH 2. Professional Java Programming:BrettSpell,WROX Publication			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes

		(PSO)
1.	CO1. Identify classes, objects, members of a class and relationships among them needed for a specific problem.	PO1,PO2,PO3,PO4,PSO1
2.	CO2:WriteJavaapplicationprogramsusingOOPprinciplesandproperDemonstrate the concepts of polymorphism and inheritance	PO1, PO3, PO4, PSO2
3.	CO3. How to test, document and prepare a professional looking package for each business project using java doc.	PO1,PO2,PO3,PO4
4.	CO3. Write Java programs to implement error handling techniques using exception handling.	PO9, PO10,PO11, PSO5

PO and PSO mapping with level of strength for Course Name Object Oriented Programming using JAVA (Course code CSE 243)

	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
	CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
	CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
	CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Syllabus: CSP 242, Data Structure Lab

School: SET		**Batch: 2019-2023**	
Program: B.Tech.		**Current Academic Year: 2019-2020**	
Branch: CSE/IT		**Semester: III**	
1	Course Code	CSP242	
2	Course Title	Data Structure Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1. Learn the basicconcepts of Data Structures and algorithms. 2. Design and Implementation of Various Basic and Advanced Data Structures. 3. Learn the concepts of various searching, Sorting and Hashing Techniques. 4. Choose the appropriate data structures and algorithm design method for a specified application.	
6	Course Outcomes	CO1: Handle operation like traversing, insertion, deletion, searching etc. on various data structures. CO2 Implement the application of linear data structure(s) to solve various problems CO3: Implement the application of non linear data structure(s) to solve various problems. CO4: Implement and know when to apply standard algorithms for searching and sorting. CO5: Choose the most appropriate data structure(s) for a given problem	
7	Course Description	This course starts with an introduction to data structures with its classification, efficiency of different algorithms, array and pointer based implementations and Recursive applications. As the course progresses the study of Linear and Non-Linear data structures are studied in details. The course talks primarily about Linked list, stacks, queue, Tree structure, Graphs etc. This Course also deals with the concept of searching, sorting and hashing methods.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	**CO1**
		Program to implement Operation on Array such as Traversing, Insertion & Deletion operation	**CO1**
		Program based on Recursion such as Towers of Hanoi, Fibonacci series etc.	CO1
	Unit 2	**Linked List**	**CO2**
		Program to implement different operation on the following linked list: Singly, Doubly and circular linked list.	CO2

	Unit 3	**Stack & Queue**			**CO3**
		Program to Implement Stack operation using Array and Linked list			**CO3**
		Program to convert infix expression to post fix expression			**CO3**
		Program on Evaluation of Post fix expression			**CO3**
		Program to implement queue operation using array and linked list			**CO3**
		Program to implement circular queue and deque.			**CO3**
	Unit 4	**Tree & Graph**			**CO4, CO6**
		Program to implement binary tree and BST.			**CO4, CO6**
		Program to implement MST and shortest path algorithm.			CO4, CO6
	Unit 5	**Searching, Sorting & Hashing**			**CO5**
		Program on Searching and Hashing			**CO5**
		Program on Sorting.			CO5
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1. Lipschutz, "Data Structures" Schaum's Outline Series, TMH			
	Other References	1. Aaron M. Tenenbaum, Yedidyah Langsam and Moshe J. Augenstein "Data Structures Using C and C++" , PHI 2. Horowitz and Sahani, "Fundamentals of Data Structures", Galgotia Publication 3. Jean Paul Trembley and Paul G. Sorenson, "An Introduction to Data Structures with applications", McGraw Hill 4. R. Kruse etal, "Data Structures and Program Design in C", Pearson Education 5. G A V Pai, "Data Structures and Algorithms", TMH			

Syllabus: CSP 243, Object Oriented Programming Using JAVA Lab

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch:CSE		**Semester:III**	
1	Course Code	CSP243	
2	Course Title	Object oriented programming using JAVA Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1. Gain knowledge about basic Java language syntax and semantics to write Java programs and use concepts such as variables, conditional and iterative execution methods etc. 2. Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms. 3. Understand the principles of inheritance, packages and interfaces.	
6	Course Outcomes	Students will be able to: CO1. Identify classes, objects, members of a class and relationships among them needed for a specific problem. CO2. Write Java application programs using OOP principles and proper Demonstrate the concepts of polymorphism and inheritance CO3. Write Java programs to implement error handling techniques using exception handling. CO4. How to test, document and prepare a professional looking package for each business project using javadoc.	
7	Course Description	Basic Object Oriented Programming (OOP) concepts, including objects, classes, methods, parameter passing, information hiding, inheritance and polymorphism are introduced and their implementations using Java are discussed.	
8	Outline syllabus		CO Mapping
	Unit 1	**Practical based on classes and objects**	CO1,CO2
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 2	**Practical based on constructors**	CO1,CO2
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 3	**Practical based on inheritance and package**	CO2, CO4
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 4	**Practical based on Polymorphism**	CO1, CO2
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 5	**Practical based on Exception handling**	CO1, CO3
		Sub unit - a, b and c detailed in Instructional Plan	
	Mode of examination	Practical	

	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1.Schildt H, “The Complete Reference JAVA2”, TMH			
	Other References	1. Balagurusamy E, “Programming in JAVA”, TMH 2.ProfessionalJavaProgramming:BrettSpell,WROX Publication			

Syllabus: CSP 297, Project Based Learning -1

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE / IT		**Semester: 3rd**	
1	Course Code	**CSP297**	Course Name: Project Based Learning -1
2	Course Title	Project Based Learning -1	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1.To align student's skill and interests with a realistic problem or project 2.To understand the significance of problem and its scope 3.Students will make decisions within a framework	
6	Course Outcomes	Students will be able to: CO1: Acquire practical knowledge within the chosen area of technology for project development CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach CO3: Discuss and accumulate the background information CO4: Develop effective communication skills for presentation of project related activities CO5: Contribute as an individual or in a team in development of technical projects CO6: Prepare a technical report based on the project.	
7	Course Description	In PBL-1, the students will learn how to define the problem for developing projects, identifying the skills required to develop the project based on given a set of specifications and all subjects of that Semester.	

8	Outline syllabus		CO Mapping
	Unit 1	Problem Definition, Team/Group formation and Project Assignment.	CO1, CO2
	Unit 2	Finalizing the problem statement, resource requirement, if any and design of the proposed project. Develop a block diagram and flowchart of proposed system algorithm.	CO1, CO2
	Unit 3	Implementation work under the guidance of a faculty member and obtain the appropriate results.	CO1, CO2, CO3
	Unit 4	Demonstrate and execute Project with the team.	CO3, CO4
	Unit 5	The presentation, report, work done during the term supported by the documentation, forms the basis of assessment.	CO4, CO5, CO6

		Report should include Abstract, Introduction, Proposed System Design/Algorithm, Experimentation & Result Analysis, Conclusion, and References. Presentation – PBL-1			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		60%	NA	40%	
	Text book/s*				
	Other References				

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO)
1.	CO1: Acquire practical knowledge within the chosen area of technology for project development	PO1, PO2, PO4, PO9, PO10, PO11, PO12
2.	CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach	PO1, PO2, PO4, PO7, PO9, PO10, PO11, PO12
3.	CO3: Discuss and accumulate the background information	PO1, PO2, PO5, PO9, PO10, PO11, PO12
4.	CO4: Develop effective communication skills for presentation of project related activities	PO1, PO2, PO6, PO9, PO10, PO11, PO12
5.	CO5: Contribute as an individual or in a team in development of technical projects	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12
6.	CO6: Prepare a technical report based on the project.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12

PO and PSO mapping with level of strength for Course Name Project Based Learning -1 (Course Code CSP297)

	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CSE297	CO1	3	3	-	3	-	-	-	-	3	3	2	3
	CO2	3	2	-	3	-	-	2	-	3	3	2	3
	CO3	3	2	-	-	2	-	-	-	3	3	2	3
	CO4	3	3	-	-	-	2	-	-	3	3	2	3

	CO4	3	3	2	2	2	2	3	3	3	3	2	3
	CO4	3	3	2	2	2	2	3	3	3	3	2	3

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: CSP 299, Summer Internship-1

School: SET		**Batch: 2019-2023**		
Program:B.Tech		**Current Academic Year: 2019-2020**		
Branch: CSE		**Semester:III**		
1	Course Code	CSP299	Course Name	
2	Course Title	Summer Internship-1		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-0		
	Course Status	UG		
5	Course Objective	1. Acquire knowledge of the industry in which the internship is done. 2. Apply knowledge and skills learned in the classroom in a work setting. 3. To decide the future application areas of Computer Science and Engineering.		
6	Course Outcomes	CO1. An ability to apply knowledge of mathematics, science, and engineering CO2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability CO3. An ability to function on multidisciplinary teams CO4. An ability to identify, formulate, and solve engineering problems CO5. An understanding of professional and ethical responsibility CO6. Understanding the impact of engineering solutions in a global, economic, environmental, and societal context		
7	Course Description	An internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting.		
8	Outline syllabus			CO Mapping
	Unit 1	Submission of Internship Proposal to be approved by academic advisor. For that students will select the company and field, ideally at the end of the first year.		CO1
	Unit 2	The Student will submit the work plan approved by		CO2

		the supervising faculty at the university and the internship supervisor for the organisation offering the internship.			
	Unit 3	The student will do project implementation during Internship under the guidance of the Program Director of the Host Organization. it will be further supervised by faculty members at the University. This activity must guarantee continuous presence and continuity to activities related to project.			CO3,CO4
	Unit 4	Submission of evaluation form and final report completed by the intern.			CO4,CO6
	Unit 5	Final evaluation form completed by the supervisor at the Host Organization and final presentation before departmental committee.			CO5
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	NIL	40%	
	Text book/s*	NA			
	Other References	NA			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1. An ability to apply knowledge of mathematics, science, and engineering	PO1, PO2, PO12, PSO4
2.	CO2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.	PO1, PO12, PSO1, PSO4
3.	CO3. An ability to function on multidisciplinary teams	PO1, PO2, PO12, PSO2, PSO4
4.	CO4. An ability to identify, formulate, and solve engineering problem.	PO1, PO12, PSO2, PSO4
5.	CO5. An understanding of professional and ethical responsibility.	PO1, PO6, PO8, PO12, PSO2, PSO4

PO and PSO mapping with level of strength for Industrial Internship(Course Code CSP 299)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2	PSO 3	PSO 4	PSO 5
CO1	3	2	-	-	-	-	-	-	-	-	-	3	3	-	-	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	3	-	3	-	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	3	-	2	-	3	-
CO4	3	-	-	-	-	-	-	-	-	-	-	3	-	3	-	2	-
CO5	3	-	-	-	-	2	-	2	-	-	-	3	-	3	-	3	-

1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Syllabus: CSE 244, Principles of Operating System

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester: IV**	
1	Course Code	**CSE 244**	Course Name: Principles of Operating System
2	Course Title	Principles of Operating System	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	1. This course introduces the challenges for designing the operating systems. 2. Includes different design principles and algorithms. 3. Evaluation of algorithms proposed. 4. Implementation of algorithms and utilities.	
6	Course Outcomes	Students will be able : **CO1:**To Understand the basic concept of Operating system. **CO2:**Explore process management concepts including scheduling, synchronization, deadlocks **CO3:** To understand and implement algorithms in resource allocation and utilization. **CO4:** To integrate and interpret effectiveness, efficiency of algorithms used for resource management of operating systems.	
7	Course Description	This course introduces the design principles of operating systems, resource management, identifying challenges and applying respective algorithms.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Operating System Concepts and functions, Comparison of different Operating system	CO1
	B	Types of Operating Systems (Batch, Multiprogramming ,Multi Tasking , Multiprocessing, Distributed and Real Time Operating System)	CO1
	C	Operating System Structure(Monolithic, Layered and Microkernel), Operating System Services	CO1
	Unit 2	**Process Synchronization**	
	A	Process Concepts (PCB, Process States , Process Operations, Inter process communication)	CO1, CO2
	B	Critical Section problem & their solutions, Introduction to Semaphores	CO1, CO2
	C	Classical Problems of Synchronization(Producer Consumer Problem, Readers Writer Problem, Dining philosophers problem)	CO1, CO2
	Unit 3	**CPU Scheduling**	

	A	Concept , Types of schedulers(Short term, Long term, Middle term), Dispatcher, Performance Criteria	CO1,CO2
	B	CPU Scheduling Algorithms(FCFS, SJF, Priority, Round Robin, Multilevel Queue, Multilevel feedback Queue)	CO1,CO2,CO3,CO4
	C	Deadlock concepts & Handling Techniques(Avoidance, Prevention and Detection & Recovery)	CO1,CO2,CO3,CO4
	Unit 4	**Memory Management**	
	A	Memory Hierarchy, Memory Management Unit	CO1,CO2,CO3
	B	Paging, Segmentation	CO1,CO2,CO3
	C	Virtual memory concept, demand paging, Page replacement algorithms(FCFS, Optimal, LRU)	CO1,CO2,CO3
	Unit 5	**INPUT-OUTPUT Management**	
	A	Input –Output interface, Modes of data transfer(Programmed, interrupt and DMA)	CO1,CO2,CO3
	B	Disk structure , Disk scheduling(FCFS,SSTF, SCAN, LOOK,C-SCAN, C-LOOK)	CO1,CO2,CO3,CO4
	C	File Concept ,File operations, File Directories, Case study of Windows Operating System	CO1,CO2,CO3
	Mode of examination	Theory	
	Weightage Distribution	CA 30% / MTE 20% / ETE 50%	
	Text book/s*	2. Silberschatz G, *Operating System Concepts*, Wiley	
	Other References	1. W. Stalling, "Operating System", Maxwell Macmillan 2. Tannenbaum A S, *Operating System Design and Implementation*, Prentice Hall India 3. Milenkovic M, *Operating System Concepts*, McGraw Hill	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** To identify the challenges and apply suitable algorithms for them.	PO1,PO2,PO3,PO4,PSO1
2.	**CO2:** To assess the strengths and weaknesses of the algorithms.	PO1, PO3, PO4, PSO2
3.	**CO3:** To understand and implement algorithms in resource allocation and utilization.	PO1,PO2,PO3,PO4
4.	**CO4:** To integrate and interpret effectiveness, efficiency of algorithms used for resource management of operating systems.	PO9, PO10,PO11, PSO5

PO and PSO mapping with level of strength for Course Name Principles of Operating System (Course Code CSE 244)

CSE244	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
	CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
	CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
	CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

Syllabus: CSE 248, Computer Networks

School: SET		**Batch: 2019-2023**	
Program: B.tech		**Current Academic Year: 2019-2020**	
Branch:CSE		**Semester: 4**	
1	Course Code	CSE248 | Course Name: B. Tech	
2	Course Title	**Computer Networks**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Compulsory	
5	Course Objective	1. Provide students with an overview of networking 2. Gain insight into the issues, challenges and work at all level of reference models 3. Provide the students with practice on applying network design 4. Enhance students communication and problem solving skills	
6	Course Outcomes	Students will be able to: **CO1:**Demonstrate and differentiate working of all layers of the OSI Reference Model and TCP/IP model **CO2:**Investigate and explore fundamental issues driving network design including error control, IP addressing, access control, flow and congestion control **CO3:**Have a basic knowledge of the use ofcryptography and network security; **CO4:**Understand and analyze working of various routing algorithms	
7	Course Description	To familiarize with the basic taxonomy and terminology of computer networking area.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction to computer networks, applications and uses, classification of Networks based on topologies, geographical distribution and communication techniques	CO1, CO2
	B	**Reference models:** OSI model, TCP/IP model , Overview of Connecting devices (Hub, Repeaters, Switches, Bridges, Routers, Gateways)	CO1, CO2
	C	**Transmission Media:**wired , wireless, Multiplexing techniques-FDM, TDM	CO1, CO2
	Unit 2	**Data Link Layer**	
	A	Functions, Framing, Error Control-Error correction codes(Hamming code),Error Detection codes(Parity Bit, CRC)	CO1, CO2
	B	Flow Control- Stop and Wait Protocol, Sliding window –Goback N and Selective repeat(ARQ)	CO1, CO2
	C	MAC- Sub-layer Protocols: ALOHA, CSMA, CSMA/CD protocols, IEEE Standards 802.3, 802.4,802.5	CO1, CO2
	Unit 3	**Network Layer**	
	A	Design issues , IPV4addressing basics and Header format, CIDR,	CO1,CO2

		sub-netting and sub-masking	
	B	Routing, optimality Principle Routing protocols-, Shortest path, flooding, distance vector routing , link state routing	CO1,CO2,CO4
	C	Congestion control-Leaky bucket , Token Bucket, jitter control	CO1,CO2
	Unit 4	**Transport Layer**	
	A	Need of transport layer with its services, Quality of service, connection oriented and connection less	CO1,CO2
	B	Transmission Control Protocol: Segment structure and header format, TCP Connection Management, Flow Control	CO1,CO2
	C	TCP congestion control, Internet Congestion Control Algorithm, Overview of User Datagram Protocol (UDP)	CO1,CO2
	Unit 5	**Application Layer**	
	A	Domain Name System (DNS), HTTP, FTP, SMTP	CO1,CO2
	B	Network Security services, cryptography, Symmetric versus Asymmetric cryptographic algorithms- DES, and RSA	CO1,CO2,CO3
	C	Application of Security in Networks: Digital signature	CO1,CO2,CO3
	Mode of examination	Theory	
	Weightage Distribution	CA: 30%	MTE: 20%	ETE: 50%	
	Text book/s*	9. Tanenbaum, A.S." Computer Networks", 4th Edition, PHI	
	Other References	1. Forouzan, B.., "Communication Networks", TMH, Latest Edition 2. W. Stallings, "Data and Computer Communication" Macmillan Press	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** Demonstrate and differentiate working of all layers of the OSI Reference Model and TCP/IP model	PO11,PO12,PSO2,PSO3,PSO4
2.	**CO2:**Investigate and explore fundamental issues driving network design	PO1,PO3,PO4,PO5,PO7,PO10,PO11PO12,PSO4
3.	**CO3:**Have a basic knowledge of the use of cryptography and network security;	PO1,PO2,PO4,PO6,PO7,PO8,PO10,PSO1,PSO3
4.	**CO4:**Understand and analyze working of various routing algorithms	PO2,PO7,PSO2,PSO3

CSE248	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	-	-	-	-	-	-	-	-	-	-	1	3	-	2	3	1	-
	CO2	3	-	3	3	2	-	3	-	-	3	1	2	-	-	-	1	-

	CO 3	2	3	-	2	-	2	3	2	-	2	-	-	1	-	3	-	-
	CO 4	-	2	-	-	-	-	1	-	-	-	-	-	-	1	3	-	-

Syllabus: CSE 249, Database Management System

School:		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester: IV**	
1	Course Code	CSE249 / Course Name	
2	Course Title	**Database Management System**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status		
5	Course Objective	1.Develop the ability to design, 2. Implement and manipulate databases. 3. Introduce students to build data base management systems. 4. Apply DBMS concepts to various examples and real life applications.	
6	Course Outcomes	Students will be able to: 1. Apply the knowledge of databases to E-R modelling. 2. Apply the concept of Relational Database model to databasedesign. 3. Learn and apply Structured Query Language (SQL) for data definition and data manipulation. 4.Design a normalized databaseand able to perform transaction management and concurrency control.	
7	Course Description	This course introduces database design and creation using a DBMS product. Emphasis is on, normalization, data integrity, data modeling, and creation of simple tables, queries, reports, and forms. Upon completion, students should be able to design and implement normalized database structures by creating simple database tables, queries, reports, and forms.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Databases:**	
	A	Introduction ofof DBMS, Characteristic of DBMS, Data Models, Database languages, Database Administrator, Database Users.	CO1
	B	Three Schema architecture of DBMS, Data Models,Hierarchical, Network ,Data independence and database language, DDL, DML, Data Modeling using Entity Relationship Model	CO1,CO2
	C	Strong Entity, Weak entity, Specialization and generalization, converting ER Model to relational tables.	CO1,CO2
	Unit 2	**Relational Database Language and Interfaces:**	
	A	Relational data model concepts ,Concept of keys, Mapping Constraints	CO3,CO2
	B	Null Values, Domain Constraints, Referential Integrity	CO3,CO2

		Constraints	
	C	Unary Relational Operations: SELECT and PROJECT Relational Algebra Operations from Set Theory ,Binary Relational Operations: JOIN and DIVISION ,SQL.	CO3,CO2
	Unit 3	**Normalization in Design of Databases:**	
	A	Functional Dependency, Different anomalies in designing a Database, Normalization first	CO4,CO2
	B	second and third normal forms, BoyceCodd normal form, multi-valued dependencies	CO4,CO2
	C	fourth normal forms, Inclusion dependencies, loss less join decompositions	CO4,CO2
	Unit 4	**Transaction Management:**	
	A	Transaction processing system, schedule and recoverability, Testing of serializability,	CO4,CO2
	B	Serializability of schedules, conflict & view serializable schedule	CO4,CO2
	C	Recovery from transaction failures, deadlock handling.	CO4,CO2
	Unit 5	**Concurrency Control**	
	A	Two-Phase Locking Techniques for Concurrency Control , Concurrency Control Based on Timestamp Ordering	CO4,CO2
	B	Multiversion Concurrency Control Techniques ,Validation (Optimistic) Concurrency Control Techniques	CO4,CO2
	C	Granularity of Data Items and Multiple Granularity Locking	CO4,CO2
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1. Korth , Silberschatz&Sudarshan, Data base Concepts, Tata McGraw-Hill, Latest Edition	
	Other References	1.Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education Inc. 2.Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to design, Implementation and Management, Pearson Education, Third Edition. 3.Jeffrey D. Ullman, Jennifer Windon, A first course in Database Systems, Pearson Education. 4.Date C.J., An Introduction to Database Systems, Addison Wesley.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:**Apply the knowledge of databases to E-R modelling.	PO1,PO2,PO3,PO10,PSO12,PSO3
2.	**CO2:**Apply the concept of Relational Database model to databasedesign.	PO1, PO2, PO3, PS5,PO9,PO10,PO11,PO12,PSO1,PSO2,PSO3,PSO5

3.	**CO3:** Learn and apply Structured Query Language (SQL) for data definition and data manipulation.	PO1,PO2,PO3,PO5,PO9,PO10,PO11,PO12,PSO1,PSO2,PSO3PSO5
4.	**CO4:**Design a normalized databaseand able to perform transaction management and concurrency control.	PO1, PO2,PO3, PO4,PO5,PO9,PO10,PO11,PO12,PSO1,PSO2,PSO3, PSO4,PSO5

PO and PSO mapping with level of strength for Course Name Database Management System(Course Code CSE 249)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	1	1	-	-	-	-	-	-	3	-	2	-	-	1	-	-
CO2	3	3	3		3	-	-	-	2	3	2	1	3	3	3	-	3
CO3	3	3	3	-	3	-	-	-	3	1	3	3	2	2	3	--	3
CO4	3	3	3	2	3	-	-	-	3	1	3	3	3	3	3	2	3

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: CSE 250, Theory of Computation

School: SET		**Batch : 2019-23**		
Program: B.Tech		**Current Academic Year:2019-23**		
Branch:CSE		**Semester:IV**		
1	Course Code	CSE-248	Course Name: Theory of Computation	
2	Course Title	Theory of Computation		
3	Credits	4		
4	Contact Hours (L-T-P)	3-1-0		
	Course Status			
5	Course Objective	The goal of this course is to provide students with an understanding of basic concepts in the theory of computation.		
6	Course Outcomes	Students will be able to: **CO1:** Formulate the concept of Automata and related terminology. **CO2:** Design DFA and NDFA and conversion from NDFA to DFA. **CO3:** Construct finite automata without output and with output. **CO4:**Implement regular expression and grammar corresponding to DFA and vice-versa **CO5:** Design Push down Automata from Context Free Language or Grammar and vice-versa. **CO6:** Design Turing Machine for computational problems, Develop a clear understanding of un-decidability.		
7	Course Description	The course introduces some fundamental concepts in automata theory and formal languages including grammar, finite automaton, regular expression, formal language, pushdown automaton, and Turing machine. Not only do they form basic models of computation, they are also the foundation of many branches of computer science, e.g. compilers, software engineering, concurrent systems, etc. The properties of these models will be studied and various rigorous techniques for analyzing and comparing them will be discussed, by using both formalism and examples.		
8	Outline syllabus			CO Mapping
	Unit 1	**Finite Automata**		
	A	Introduction to languages, Kleene closures, Finite Automata (FA), Transition graph, Nondeterministic finite Automata (NFA), Deterministic finite Automata (DFA).		CO1, CO2
	B	Equivalence of NDFA and DFA, Construction of DFA from NFA and optimization of Finite Automata.		CO1, CO2
	C	Applications and Limitation of FA. (FAT tool).		CO1, CO2
	Unit 2	**Regular Expression and Finite Automata**		
	A	Regular Expression, Finite Automata with null move, Regular Expression to Finite Automata.		CO1, CO2,CO4
	B	Arden Theorem, Pumping Lemma for regular expressions.		CO1, CO2,CO4
	C	FA with output: Moore machine, Mealy machine and Equivalence.		CO1, CO2,CO3
	Unit 3	**REGULAR & CONTEXT FREE LANGUAGE**		
	A	Defining grammar, Chomsky hierarchy of Languages		CO4

		and Grammar. Ambiguous to Unambiguous CFG.	
	B	Simplification of CFGs.	CO4
	C	Normal forms for CFGs, Pumping lemma for CFLs.	CO4
	Unit 4	**PUSH DOWN AUTOMATA**	
	A	Description and definition of PDA and Non-Deterministic PDA, Working of PDA.	CO5
	B	Acceptance of a string by PDA with final state and with Null store. Two stack PDA.	CO5
	C	Conversion of PDA into CFG, Conversion of CFG into PDA.	CO5
	Unit 5	**TURING MACHINE**	
	A	Turing machines (TM): Basic model, definition and representation, Language acceptance by TM.	CO6
	B	Turing machine as a computational machine, Halting problem of TM, Universal TM (Visual Turing machine).	CO6
	C	Modifications in TM, Undecidability of Post correspondence problem, Church's Thesis, Godel Numbering.	CO6
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1. K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science(Automata, Languages and Computation)", PHI	
	Other References	1.Peter Linz, "Formal Languages and Auomata", Narosa Publishing House 2.Hopcroft, Ullman, "Introduction to Automata Theory, Language and Computation", Narosa Publishing House	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** Formulate the concept of Automata and related terminology.	PO1,PO2,PO3,PO4,PSO1
2.	**CO2:** Design DFA and NDFA and conversion from NDFA to DFA.	PO1, PO3, PO4, PSO2
3.	**CO3:** Construct finite automata without output and with output.	PO1,PO2,PO3,PO4
4.	**CO4:** Implement regular expression and grammar corresponding to DFA and vice-versa	PO9, PO10,PO11, PSO5
5	**CO5:** Design Push down Automata from Context Free Language or Grammar and vice-versa .	PO1,PO2,PO3,PO4,PSO1
6	**CO6:** Design Turing Machine for computational problems,Develop a clear understanding of un-decidability.	PO1,PO3,PO4,PSO2

PO and PSO mapping with level of strength for Course Name Theory of Computation **(Course Code CSE250)**

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3
CO5	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO6	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: CSP 244, Principles of Operating System Lab

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester: III**	
1	Course Code	**CSP 244**	
2	Course Title	Principles of operating System Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status		
5	Course Objective	Introduces different type operating systems, functions of operating systems, working in a Unix/Linux and Windows system, writing programs on Process management and file management.	
6	Course Outcomes	CO1: Working with single user multi task and multi-user multi-tasking environment. CO2: Identify and use utilities of Windows & Unix operating systems CO3: Use the resources of operating system i.e. process management and file management CO4: Writing programs on Process creation, multiple process creation, process synchronization, file operations and file buffering.	
7	Course Description	The course is designed to make the students research/industry ready as operating systems are indispensable for the systems used in industries/research organizations. New operating systems for different gadgets are launched in last few years. So the students will get the design principles operating system in this course.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
		Illustration of Different types of operating system: Single user Multi task, Multi user Multi task	CO1
		Basic Windows features & Unix commands.	CO2
	Unit 2	**Processes**	
		Process basics: Creating processes using fork( ), the parent-child processes PID, PPID, process states: creating orphan, zombie processes.	CO2, CO3, CO4
	Unit 3	**Process Synchronization**	
		Creating multiple processes, Process table, use the command ps with –el, Synchronization of processes by using sleep( ) & wait( ), background process,	CO3, CO4

	Unit 4	**Files**			
		Basic file operations, Programs for File operations, sharing data between processes using files.			CO3, CO4
	Unit 5	**File Buffering**			
		File descriptor table, system file table, file pointer, buffer accessing block wise, use the functions: fopen( ), fread( ), ftell( ), lseek( ), fflush( ) etc.			CO3, CO4
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1. Sumitabha Das, "Unix Concepts and Applications", Tata McGraw Hill.			
	Other References	1. Unix: The complete Reference, Kenneth Rosen et.al., TMH 2. Unix 'C' Odessey, Meeta Gandhi et.al. BPB			

Course outline This course introduces the features of GUI i.e. Windows operating system as well as the CUI i.e. the commands used in Unix, so that the students will be familiar with both GUI & CUI environment of operating systems. As the course progresses the students will learn to write programs for process management and file operations. Further the students can implement the algorithms studied in theory by writing programs using the above principles and skills.	
Course Evaluation	
Attendance	None
Any other	CA judged on the practical conducted in the lab , weightage may be specified
References	
Text book	1. Sumitabha Das, "Unix Concepts and Applications", Tata McGraw Hill.
Other References	1. Unix: The complete Reference, Kenneth Rosen et.al., TMH 2. Unix 'C' Odessey, Meeta Gandhi et.al. BPB
Software	Windows, Unix / Any Unix family OS i.e. Linux

1	Course Code	CSE245
2	Course Title	Discrete Structures
3	Credits	4
4	Contact Hours	3-1-0
5	Course Objective	This course provides a mathematical foundation for subsequent study in Computer Science, as well as developing the skills necessary to solve practical problems.
6	Course Outcomes (CO)	After the completion of this course, students will be able to: CO-1. ***Know*** the basic principles of sets and operations in sets. CO-2. ***Classify*** logical notation and determine if the argument is or is not valid. CO-3. ***Use*** algebraic structures to construct models and prove. CO-4. ***Analyze*** basic principles of Boolean algebra with mathematical description. CO-5. ***Integrate*** Permutations and combinations in counting techniques and applications of Graph Theory. CO-6. ***Support*** ability to describe computer programs in a formal mathematical manner.
7	**Prerequisite**	Concepts of algebra
8	**Course Contents**	
8.01	Unit A	**Introduction to Set Theory, Relations and Functions.**
8.02	Unit A Topic 1	Set Theory: Introduction, Combination of sets, Multi sets, ordered pairs, Set Identities.
8.03	Unit A Topic 2	Relations: Definition, Operations on relations, Properties of relations, Composite Relations, Equality of relations, Order of relations.
8.04	Unit A Topic 3	Functions: Definition, Classification of functions, Operations on functions, Recursively defined functions.
8.05	Unit B	**Logics and Mathematical Induction**
8.06	Unit B Topic 1	Propositional Logic: Proposition, well formed formula, Truth tables, Tautology, Satisfiability, Contradiction, Algebra of proposition, Theory of Inference, Natural Deduction.
8.07	Unit B Topic 2	Predicate Logic: First order predicate, well formed formula of predicate, quantifiers, Inference theory of predicate logic.
8.08	Unit B Topic 3	Natural Numbers: Introduction, Mathematical Induction, Variants of Induction, Induction with Nonzero Base cases.
8.09	Unit C	**Algebraic Structures**
8.10	Unit C Topic 1	Definition, Groups, Subgroups and order, Cyclic Groups, Cosets, Lagrange's theorem, Normal Subgroups,
8.11	Unit C Topic 2	Homomorphism’s, Definition and elementary properties of Rings and Fields, Integers Modulo n.
8.12	Unit C Topic 3	Partial order sets: Definition, Partial order sets, Combination of partial order sets, Hasse diagram.

8.13	Unit D	**Lattices and Applications**
8.14	Unit D Topic 1	Definition, Properties of lattices – Bounded, Complemented, Modular and Complete Lattice, Morphisms of lattices.
8.15	Unit D Topic 2	Boolean Algebra: Introduction, Axioms and Theorems of Boolean algebra, Algebraic manipulation of Boolean expressions. Simplification of Boolean Functions, Karnaugh maps, Logic gates, Digital circuits and Boolean algebra. Combinational and sequential Circuits.
8.16	Unit D Topic 3	Recurrence Relation & Generating function: Recursive definition of functions, Recursive algorithms, Method of solving recurrences.
8.17	Unit E	**Graph Theory and Applications.**
8.18	Unit E Topic 1	Trees: Definition, Binary tree, Binary tree traversal, Binary search tree.
8.19	Unit E Topic 2	Graphs: Definition and terminology, Representation of graphs, Multi graphs, Bipartite graphs, Planar graphs, Isomorphism and Homeomorphism of graphs, Euler and Hamiltonian paths, Graph colouring.
8.20	Unit E Topic 3	Combinatorics: Introduction, Counting Techniques, Pigeonhole Principle
9	**Course Evaluation: Continuous Assessment-30 Marks**	
9.1	Attendance	--
9.2	Homework	2 assignments, no weight
9.3	Quizzes	7 best quizzes (based on assignments) - 15 marks
9.4	Project	15
9.5	Any other	NO
9.6	**Mid Term Examination**	**20 Marks**
9.7	**End Term Examination**	**50 Marks**
10	**Reading Content**	
10.1	Text book*	1) *1. C. L. Liu, Elements of Discrete Mathematics, second edition 1985, McGraw-Hill Book Company. Reprinted 2000.* 2) Jean Paul Trembley, R Manohar, “Discrete Mathematical Structures with Application to Computer Science”, McGraw-Hill. 3) *K. H. Rosen, Discrete Mathematics and applications, fifth edition 2003, Tata McGraw Hill Publishing Company.*
10.2	other references	1) *J .L. Mott, A. Kandel, T.P .Baker, Discrete Mathematics for Computer Scientists and Mathematicians, second edition 1986, Prentice Hall of India.* 2) *W.K. Grassmann and J.P.Trembnlay, Logic and Discrete Mathematics, A Computer Science*

PO and PSO mapping with level of strength Discrete Structures for Computer Science (CSE)

Syllabus: CSP 249, Database management System Lab

School: SET		**Batch: 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch:CSE		**Semester: IV**
1	Course Code	CSP246
2	Course Title	Database Management System Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	• To Develop efficient SQL programs to access Oracle databases • Build database using Data Definition Language Statements • Perform operations using Data Manipulation Language statements like Insert, Update and Delete
6	Course Outcomes	By the end of this course you will be able to: CO1: Understandthe concept of SQL commands in DBMS CO2: Create SQL SELECT statements that retrieve any required data CO3: Perform operations using Data Manipulation Language statements like Insert, Update and Delete CO4: Manipulate your data to modify and summaries your results for reporting
7	Course Description	An introduction to the design and creation of relational databases. Create database-level applications and tuning robust business applications. Lab sessions reinforce the learning objectives and provide participants the opportunity to gain practical hands-on experience.

8	Outline syllabus		CO Mapping
	Unit 1	**Practical based Data types**	
		Classification SQL, Data types of SQL/Oracle	CO1,CO2
	Unit 2	**Practical based on DDL commands**	
		Create table , Alter table and drop table	CO1,CO2
	Unit 3	**DML commands and Aggregate functions**	
		Introduction about the INSERT, SELECT , UPDATE & DELETE command.,sum,avg,count,max,min	CO2,CO4
	Unit 4	**Practical based on Grouping Clauses GROUP BY ORDER BY & GROUP BY HAVING**	CO1,CO4
		Briefly explain Group by, order by ,having clauses with examples.	
	Unit 5	**Practical based on Sub- queries, JOINS**	CO1,CO4
		Related example of Sub- queries, Joins and related examples	

	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1. Korth , Silberschatz& Sudarshan, Data base Concepts, Tata McGraw-Hill			
	Other References	1. Elmasri, Navathe, Fundamentals of Database Systems, Pearson Education Inc. 2. Thomas Connolly, Carolyn Begg, Database Systems: A Practical Approach to design, Implementation and Management, Pearson Education, Latest Edition. 3. Jeffrey D. Ullman, Jennifer Windon, A first course in Database Systems, Pearson Education.			

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<tr><td>Current Academic Year: 2019-20</td><td></td></tr>
<tr><td>Semester: 4th</td><td></td></tr>
<tr><td>1</td><td>Course Code</td><td>ARP204</td><td></td></tr>
<tr><td>2</td><td>Course Title</td><td>Quantitate and Qualitative Aptitude Sill Building</td><td></td></tr>
<tr><td>3</td><td>Credits</td><td>2</td><td></td></tr>
<tr><td>4</td><td>Contact Hours (L-T-P)</td><td>1-0-2</td><td></td></tr>
<tr><td>5</td><td>Course Objective</td><td>To enhance holistic development of students and improve their employability skills. Provide a 360 degree exposure to learning elements of Business English readiness program, behavioural traits, achieve softer communication levels and a positive self-branding along with augmenting numerical and altitudinal abilities. To up skill and upgrade students' across varied industry needs to enhance employability skills. By the end of this semester, a will have entered the threshold of his/her 2nd phase of employability enhancement and skill building activity exercise.</td><td></td></tr>
<tr><td>6</td><td>Course Outcomes</td><td>CO1: Learn what is VMOSA (Vision, Mission, Values and Ethics) Communication Process
CO2: Communication Styles and flexing and 4 social styles of communication
CO3: Understand Listening Skills and Listening Styles
CO4: Understanding the Art of giving feedback and probing
CO5: Business writing skills and non-verbal communication
CO6: MTI Reduction Program | Verbal Abilities - 2
CO7: 2nd Level proficiency in Quant & Aptitude Reasoning abilities</td><td></td></tr>
<tr><td>7</td><td>Course Description</td><td>This course bundle allows students to build vision, mission and strategy statements while exposing them to various models of communication along with MTI reduction and the 2nd level of quant, aptitude and reasoning abilities</td><td></td></tr>
<tr><td>8</td><td colspan="2">Outline syllabus – ARP204</td><td>CO MAPPING</td></tr>
<tr><td></td><td>Unit 1</td><td>Communicate to Conquer</td><td></td></tr>
<tr><td></td><td>A</td><td>VMOSA (Vision, Mission, Values and Ethics) |Business Communication - Verbal Communication Skills | Barriers in communication | Basics of effective communication – PRIDE Model</td><td>CO1,</td></tr>
<tr><td></td><td>B</td><td>Different styles of communication & style flexing (Based on the 4 social styles-Analytical, Driving, Expressive, Amiable) | Importance of Listening & practice of Active Listening - Sentence Arrangements, Correction Analogies| The Art of Giving Feedbacks| Feedback Skills | Asking fact finding questions- Probing Skills</td><td>CO2, CO3,CO4</td></tr>
<tr><td></td><td>C</td><td>Email Etiquette | Business Writing Skills| Telephone Etiquette Skills (Telephone Handling Skills) | Non Verbal Communication-Kinesics, Proxemics, Paralanguage | MTI Reduction Program | Verbal Abilities - 2</td><td>CO5, CO6</td></tr>
<tr><td></td><td>Unit 2</td><td>Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical</td><td></td></tr>
<tr><td></td><td>A</td><td>Coding Decoding , Ranking & Their Comparison Level-2</td><td>CO7</td></tr>
<tr><td></td><td>B</td><td>Series, Blood Relations & Number Puzzle</td><td>CO7</td></tr>
<tr><td></td><td>Unit 3</td><td>Quantitative Aptitude</td><td></td></tr>
</table>

	A	Number System Level 2	CO7
	B	Vedic Maths Level-2 | Probability | Permutation & Combination	CO7
	C	Percentage, Profit & Loss ,Partnership, Simple Interest & Compound Interest	CO7
	Weightage Distribution	*(CA)Class Assignment/Free Speech Exercises / JAM – 60% | (ETE) Group Presentations/Mock Interviews/GD/ Reasoning, Quant & Aptitude – 40%*	
	Text book/s*	*Wiley's Quantitative Aptitude-P Anand* | ***Quantum CAT – Arihant Publications | Quicker Maths- M. Tyra |*** *Power of Positive Action (English, Paperback, Napoleon Hill) | Streets of Attitude (English, Paperback, Cary Fagan, Elizabeth Wilson) The 6 Pillars of self-esteem and awareness – Nathaniel Brandon | Goal Setting (English, Paperback, Wilson Dobson*	

Syllabus: CSE 011, Mathematical Techniques (Program Elective-1)

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch:CSE		**Semester:V**	
1	Course Code	CSE 348	Course Name
2	Course Title	Mathematical Techniques	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Program Elective-I	
5	Course Objective	The objective of the course is to teach students the mathematical & statistical techniques that provide sound basis for research and application development in Computer Science.	
6	Course Outcomes	By the end of the course, students will be able to: **CO1:** Understand important mathematical and statistical methods that are essential for Computer Science research and application development; **CO2:** Apply mathematical and statistical methods in their research and application development. **CO3:**Use a mathematical tool such as MATLAB efficiently.	
7	Course Description	In this subject, the fundamental concepts and principles of Mathematical & Statistical Techniques together with the challenging issues in Computer Science software development will be introduced. Discussion on various topics related to mathematics and Computer Science will also be conducted.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction,Computational Errors andtheirAnalysis**	
	A	Accuracyofnumbers,Errorsandageneralerrorformula,ErrorsinNumericalComputations.	CO1, CO2
	B	Errorsina Series Approximation.	CO1, CO2
	C	Precisions	CO1, CO3
	Unit 2	**Numerical Techniques**	
	A	LU decomposition for systems of linear equations;	CO1, CO2
	B	numerical solutions of non-linear algebraic equations by Secant, Bisection	CO1, CO2,

		and Newton-Raphson Methods;			
	C	Numerical integration by trapezoidal and Simpson's rules.			CO1, CO2
	Unit 3	**Probability**			
	A	Probability: Conditional Probability;			CO1,CO2
	B	Mean, Median, Mode and Standard Deviation;.			CO1,CO2,CO3
	C	Random Variables; Distributions;			
	Unit 4	**Permutation**			
	A	uniform, normal, exponential			CO1,CO2
	B	Poisson, Binomial distribution			CO1,CO2
	C	Permutations; Combinations; Counting; Summation;			CO1,CO2,CO3
	Unit 5	**Hypothesis testing**			
	A	Generating functions; recurrence relations;			CO2,CO3
	B	Techniquesforstatisticalqualitycontrol,			CO2,CO3
	C	Testingofhypothesis.			CO1,CO2,CO3
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	M. Goyal, "Computer Based Numerical & Statistical Techniques", Infinity Science Press, LLC, MA, USA.			
	Other References	1. Matheus Grasselli and Dimitry Pelinovsky, "Numerical Mathematics", Jones and Bartlet Publishers, USA. 2. Lars Elden, "Mattrix Methods in Data Mining and Pattern Recognition", SIAM (Society for Industrial and Applied Mathematics), USA. 3. Internet as a resource for references.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** Understand important mathematical and statistical methods that are essential for Computer Science research and application development;	PO1,PO2,PO3, PSO1
2.	**CO2:** Apply mathematical and statistical methods in their research and application development.	PO1, PO3, PSO2
3.	**CO3:**Use a mathematical tool such as MATLAB efficiently.	PO1,PO2,PO3

Syllabus: CSE012,Introduction to Graph Theory and its Applications(Program Elective-1)

School: SET		**Batch: 2019-2023**		
Program: B.Tech		**Current Academic Year: 2019-2020**		
Branch:CS/IT		**Semester:5**		
1	Course Code	CSE349	Course Name: Introduction to Graph Theory and its Application	
2	Course Title	Introduction to Graph Theory and its Application		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	Program Elective-I		
5	Course Objective	The objective of the course is to teach students the basic graph theory concepts and their applications in computer science.		
6	Course Outcomes	After successful completion of the course students will be able to **1.** demonstrate some of the most important notions and types of graph theory and develop their skill in solving basic exercises **2.** interpret the fundamentals of graphs and trees and to relate them with the use in computer science applications **3.** explore a graph with the help of matrices and to find a minimal spanning tree for a given weighted graph **4.** apply graph-theoretic algorithms and methods used in computer science **5.** develop efficient graph-theoretic algorithms (mathematically)explore the applications of coloring problem of graph theory		
7	Course Description	This course is to teach students the basic graph theory concepts and their applications in computer science.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction**		
	A	Basic terminologies and concepts of Graph Theory, Fundamental types of graphs, Applications in various areas		CO1
	B	Properties of graphs, theorems based on different types of graph and various operations on graphs		CO1,CO4
	C	Special types of graphs (Hamiltonian, Euler), Travelling salesman problem		CO1, CO5
	Unit 2	**TREES**		
	A	Fundamentals of trees and their types, Binary trees and their properties, importance of binary trees in data structure (searching algorithms)		CO2
	B	fundamental circuits, spanning trees, algorithms to find spanning trees in a weighted graph (Kruskal& Prim)		CO2, CO3
	C	Applications: Representation of the algebraic expressions as ordered binary trees, Huffman procedure for construction of an optimal tree for a given set of weights.		CO4
	Unit 3	**CUT SETS**		

	A	a cut-set of a connected graph, the fundamental circuit ,Properties of circuits & cut–sets, Concept of connectivity and separability	CO1
	B	Concept of Planar graphs with introduction to Kuratowski's non-planar graphs, Proof of Euler's formula	CO4
	C	Detection of planarity , geometric duals of graph, thickness & Crossings, network flow	CO5
	Unit 4	**Coloring and Covering**	
	A	Concept of proper coloring of vertices of a graph, chromatic number , Chromatic partitioning	CO4, CO5
	B	Chromatic polynomial, finding chromatic polynomial of a given graph	CO4, CO5
	C	Matching, Covering, Five color problem and its proof	CO4, CO5
	Unit 5	**Matrix Representation of Graphs& Applications**	
	A	Incidence matrix, sub matrices of A(G), circuit matrix, fundamental circuit matrix and Rank of B	CO3, CO4
	B	Cut set matrix , fundamental cut set matrix, path matrix, Adjacency matrix	CO4
	C	Finding Rank of different matrices, Relationship among A_f, B_f, andC_f	CO4, CO5
	Mode of examination	Theory	
	Weightage Distribution	CA / 30% ; MTE / 20% ; ETE / 50%	
	Text book/s*	1. Deo, N, *Graphtheory with applications to Engineering and Computer Science*, Prentice Hall India	
	Other References	1. Wilson R J, *Introduction to Graph Theory*, PearsonEducation 2. Harary, F, *Graph Theory*, Narosa 3. Bondy& Murthy, *Graph theory and application*. Addison Wesley	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: demonstrate some of the most important notions and types of graph theory and develop their skill in solving basic exercises	PO1, PO2, PSO1
2.	CO2: interpret the fundamentals of graphs and trees and to relate them with the use in computer science applications	PO1, PO2, PO3, PO4, PSO2
3.	CO3: explore a graph with the help of matrices and to find a minimal spanning tree for a given weighted graph	PO3, PO4, PO5, PSO2
4.	CO4: apply graph-theoretic algorithms and methods used in computer science	PO4, PO5, PO6, PSO2, PSO4
5.	CO5: develop efficient graph-theoretic algorithms (mathematically) explore the applications of colouring problem of graph theory	PO4, PO5, PO9, PSO2, PSO4

PO and PSO mapping with level of strength for Course Name: Introduction to Graph Theory and its Application (CSE 012)

Cos	PO1	PO 2	PO3	PO4	PO 5	PO 6	PO7	PO 8	PO9	PO10	PO 11	PO12	PS O1	PSO2	PS O3	PSO4	PSO 5
CO1	3	3	2	2	1	1	1	1	1	1	2	2	3	2	1	2	1
CO2	3	3	3	3	2	1	1	1	2	2	1	2	2	3	1	2	1
CO3	2	2	3	3	3	2	1	1	1	2	2	2	2	3	2	2	2
CO4	2	2	2	3	3	3	1	2	2	1	1	2	2	3	2	3	1
CO5	2	2	2	3	3	2	2	2	3	1	1	2	1	3	1	3	1

1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

Syllabus: CSP 298, Project Based Learning(PBL) -2

School: SET		**Batch : 2019-2022**	
Program: B.Tech		**Current Academic Year: 2019-2019**	
Branch: CSE		**Semester: 4th**	
1	Course Code	**CSP298**	Course Name: Project Based Learning - 2
2	Course Title	Project Based Learning -2	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	1. To align student's skill and interests with a realistic problem or project 2.To understand the significance of problem and its scope 3.Students will make decisions within a framework	
6	Course Outcomes	Students will be able to: CO1: Acquire practical knowledge within the chosen area of technology for project development CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach CO3: Discuss and accumulate the background information CO4: Develop effective communication skills for presentation of project related activities CO5: Contribute as an individual or in a team in development of technical projects CO6: Prepare a technical report based on the project.	
7	Course Description	In PBL-2, the students will learn how to define the problem for developing projects, identifying the skills required to develop the project based on given a set ofspecifications and all subjects of that Semester.	

8	Outline syllabus		CO Mapping
	Unit 1	Problem Definition,Team/Group formation and Project Assignment.	CO1, CO2
	Unit 2	Description and design of the proposed project. Specifying resource requirement, if any.	CO1, CO2
	Unit 3	Implementation work under the guidance of a faculty member.	CO1, CO2, CO3
	Unit 4	Demonstrate and execute Project with the team.	CO3, CO4
	Unit 5	The presentation, report, work done during the term supported by the documentation, forms the basis of assessment.	CO4, CO5, CO6
		Report should include Abstract, Introduction, Proposed	

		System Design/Algorithm, Experimentation & Result Analysis, Conclusion, and References. Presentation – PBL-2			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		60%	NA	40%	
	Text book/s*				
	Other References				

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO)
1.	CO1: Acquire practical knowledge within the chosen area of technology for project development	PO1, PO2, PO4, PO9, PO10, PO11, PO12
2.	CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach	PO1, PO2, PO4, PO7, PO9, PO10, PO11, PO12
3.	CO3: Discuss and accumulate the background information	PO1, PO2, PO5, PO9, PO10, PO11, PO12
4.	CO4: Develop effective communication skills for presentation of project related activities	PO1, PO2, PO6, PO9, PO10, PO11, PO12
5.	CO5: Contribute as an individual or in a team in development of technical projects	PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12
6.	CO6: Prepare a technical report based on theproject.	PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12

PO and PSO mapping with level of strength for Course Name Project Based Learning -2 (Course Code CSP298)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	-	-	-	3	3	2	3
CO2	3	2	-	3	-	-	2	-	3	3	2	3
CO3	3	2	-	-	2	-	-	-	3	3	2	3
CO4	3	3	-	-	-	2	-	-	3	3	2	3

CO4	3	3	2	2	2	2	3	3	3	3	2	3
CO4	3	3	2	2	2	2	3	3	3	3	2	3

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: CSE350, Design and Analysis of Algorithm

School: SET		**Batch :2019-2023**		
Program: B.Tech		**Current Academic Year: 2019-20**		
Branch: CSE		**Semester: V**		
1	Course Code	CSE 350	Course Name: Design and Analysis of Algorithms	
2	Course Title	Design and Analysis of Algorithms		
3	Credits	4		
4	Contact Hours (L-T-P)	3-1-0		
	Course Status	UG		
5	Course Objective	Objective of this course is to 1. Reinforce basic design concepts (e.g., pseudocode, specifications, top-down design) 2. Knowledge of algorithm design strategies 3. Familiarity with an assortment of important algorithms. 4. Enable students to analyze time and space complexity		
6	Course Outcomes	Students will be able to: **CO1:** Analyze the asymptotic performance of algorithms **CO2**: Write rigorous correctness proofs for algorithms. **CO3:** Demonstrate a familiarity with major algorithms and data structures **CO4:** Apply important algorithmic design paradigms and methods of analysis		
7	Course Description	This course introduces concepts related to the design and analysis of algorithms. Specifically, it discusses recurrence relations, and illustrates their role in asymptotic and probabilistic analysis of algorithms. It covers in detail greedy strategies divide and conquer techniques, dynamic programming and max flow - min cut theory for designing algorithms, and illustrates them using a number of well-known problems and applications.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction**		
	A	Introduction : Algorithms, Analyzing algorithms, Complexity of algorithms, Growth of functions, Performance measurements		CO2, CO3
	B	Asymptotic Notations and their properties – Mathematical analysis for Recursive and Non-recursive algorithms, Recurrences relations, Master Method		CO1, CO2, CO3
	C	Divide-and-conquer: Analysis and Structure of divide-and-conquer algorithms, Divide-and-conquer examples-Quick sort, Merge sort, Sorting in Linear Time, Heap Sort		CO1, CO2, CO4
	Unit 2	**Advanced Data Structures**		

	A	Red-Black Trees - Definition, Applications, Insertion and deletion of elements in RB-Tree		CO1, CO2, CO3, CO4
	B	B-Trees - Definitions, Applications, Insertion and Deletion in B-Trees		CO1, CO2, CO4
	C	Data Structure for Disjoint Sets – Definition, Binomial Heaps, Fibonacci Heaps.		CO1, CO2, CO3, CO4
	Unit 3	**Dynamic Programming**		
	A	Overview, Difference between dynamic programming and divide and conquer, All pair shortest path problems: Floyd-Warshall Algorithm		CO1,CO2,CO3, CO4
	B	Applications and analysis: Matrix Chain Multiplication, 0/1 Knapsack Problem		CO1, CO2, CO3, CO4
	C	Applications and analysis: Longest Common sub-sequence, Optimal Binary Search tree		
	Unit 4	**Greedy Method**		CO1,CO2,CO3
	A	Overview of the Greedy paradigm, Analysis and example: task scheduling,		CO1,CO2,CO3
	B	Fractional Knapsack problem, Single source shortest paths problem: Dijkastra's Algorithm, Bellman-ford Algorithm,		CO1,CO2,CO3
	C	Overview and analysis of Backtracking & Branch and Bound: N-Queens problem and Sum of subsets		
	Unit 5	**Selected Topics**		CO1,CO2,CO3,
	A	Introduction to NP Complete and NP Hard Problems, Examples, Amortized Analysis		CO1,CO2,CO3,
	B	Approximation Algorithms – Travelling Sales Person Problem and Vertex Cover Problem, Randomized Algorithms, Randomized Quick Sort Algorithm		CO1,CO2,CO3
	C	String Matching Algorithms – Naive String Matching Algorithm, Rabin Karp Algorithm.		CO1,CO2,CO3, CO4
	Mode of examination	Theory		
	Weightage Distribution	CA / 30%	MTE / 20%	ETE / 50%
	Text book/s*	3. Cormen et al., "Introduction of Computer Algorithms", Prentice Hall India		
	Other References	3. Sahni et al., "Fundamentals of Computer Algorithms", Galgotia Publications. 4. Hopcroft A, The Design And Analysis Computer Algorithms, Addison Wesley		

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:**Analyze the asymptotic performance of algorithms	PO1,PO2,PO3,PO4,PSO1
2.	**CO2**: Write rigorous correctness proofs for algorithms	PO1, PO3, PO4, PSO2
3.	**CO3:** Demonstrate a familiarity with major algorithms and data structures	PO1,PO2,PO3,PO4
4.	**CO4:**Apply important algorithmic design paradigms and methods of analysis	PO9, PO10,PO11, PSO5

PO and PSO mapping with level of strength for Course Name Design and Analysis of Algorithm Course Code CSE 350)

Cos	PO1	PO 2	PO3	PO4	PO5	PO 6	PO7	PO 8	PO9	PO10	PO 11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

1	Course number	CSE021
2	Course Title	**Introduction to Cloud Computing**
3	Credits	**3**
4	Contact Hours	**3-0-0**
5	Course Objective	This introductory course on Cloud computing will teach both the fundamental concepts of how and why Cloud systems works, as well as Cloud technologies that manifest these concepts.
6	Course Outcomes	At the end of the course, students will have achieved the following learning objectives. 1. Classify and describe the architecture and taxonomy of parallel and distributed computing, including shared and distributed memory, and data and task parallel computing. 2. Characterize the distinctions between Infrastructure, Platform and Software as a Service (IaaS, PaaS, SaaS) abstractions, and Public and Private Clouds, and analyze their advantages and disadvantages. 3. Examine the design of task and data parallel distributed algorithms for Clouds and use them to construct Cloud applications. Demonstrate the use of Map-Reduce, Vertex-Centric and Continuous Dataflow programming models..
7	Outline syllabus	
7.01	Unit A	**Introduction**
7.02	Unit A Topic 1	Introduction to distributed systems and cloud computing
7.03	Unit A Topic 2	Cloud architectures: SaaS, PaaS, IaaS.
7.04	Unit A Topic 3	End-to-end system design. Networks and protocol stacks.
7.05	Unit B	**Remote Procedure Call**
7.06	Unit B Topic 1	Client-server computing. Sockets and remote procedure call.
7.07	Unit B Topic 2	RMI, CORBA.
7.08	Unit B Topic 3	Storage in the Cloud: Google file system.
7.09	Unit C	**Cloud Services**
7.10	Unit C Topic 1	Web services and REST. Example: Amazon S3.
7.11	Unit C Topic 2	The JAX-RS API, Persistent cloud services.
7.12	Unit C Topic 3	Three-tier middleware. JEE APIs. Google App Engine.
7.13	Unit D	**Sockets**
7.14	Unit D Topic 1	Message queues and message brokers.
7.15	Unit D Topic 2	JMS and Atmosphere. Web sockets
7.16	Unit D Topic 3	Distributed snapshots.
7.17	Unit E	**Applications**
7.18	Unit E Topic 1	Batch cloud computing: MapReduce and Hadoop.
7.19	Unit E Topic 2	Applications in NoSQL data stores, Applications to scientific data Mining techniques.
7.20	Unit E Topic 3	Popular Cloud Computing Systems from Google, Microsoft & IBM.
9.1	Text book	Dominic Duggan, Enterprise Software Architecture and Design, Willy Publication, 2013.
9.2	Other references	1. Distributed and Cloud Computing, 1st edition, Morgan Kaufmann, 2011. 2. Greg Schulz, “Cloud and Virtual Data Storage Networking”, Auerbach Publications [ISBN: 978-1439851739], 2011. 3. Marty Poniatowski, “Foundations of Green IT” Prentice Hall; 1 edition, 2009. 4. 5. EMC, “Information Storage and Management” Wiley; 2 edition,2012. 5. Internet as a resource for reference

1	Course Code	**CSE022**
2	Course Title	**Android Application Development**
3	Credits	**3**
4	Contact Hours	**3-0-0**
5	Course Objective	
6	Course Outcomes	
7	**Prerequisite**	**Knowledge of java programming**
8	**Course Contents**	
8	Unit A	**Introduction to Android**
8	Unit A Topic 1	Android architecture, Feature of android, Limitation of mobile devices
8	Unit A Topic 2	Configuration of android SDK, Activity life cycle, AVD manager
8	Unit A Topic 3	Generation of APK file for android project, Test run of application on device
8.1	Unit B	**Android UI Components**
8.1	Unit B Topic 1	Layouts-Linear layout, Relative layout, Table layout, Frame layout
8.1	Unit B Topic 2	Event delegation model, Type of Event Listeners, Onclick, OnLongClick, OnFocusChanged, OnKeyUp, OnKeyDown
8.1	Unit B Topic 3	Button, TextView, EditTextView, Label, List, Radio Button, Checkbox, date picker
8.1	Unit C	**Notification and Intents**
8.1	Unit C Topic 1	Type of notification, Toast notification, status bar notification and alert notification
8.1	Unit C Topic 2	Concept of intent, configuration of intent, Intent filters
8.1	Unit C Topic 3	Creating Menu, Option Menu, Context Menu, Popup Menu
8.1	Unit D	**Working with SQL Lite**
8.1	Unit D Topic 1	Introduction to SQLite databse, Steps for connecting application with database.
8.2	Unit D Topic 2	Fetch and update data in database from application,
8.2	Unit D Topic 3	Cursor and content value, opening and closing database
8.2	Unit E	**Sensor Device**
8.2	Unit E Topic 1	Sensor Manager, Sensor Framework, Types of Sensors Accelerometer, Gyroscope, Proximity Sensor, Orientation, Light Sensor
8.2	Unit E Topic 2	Detect availability of sensor, Fetch data from sensors on frequent basis,
8.2	Unit E Topic 3	Development of compass application with help of gyroscope sensor
9	**Course Evaluation**	
10	**Reading Content**	
10	Text book*	1. Android Application Development, Wrox publication

10	other references	1. Android UI Fundamentals : Develop and Design 2. Internet as a resource for reference

School: SET		**Batch :** 2019-20 **Current Academic Year:** 2019-20 **Semester:** **5th**	
1	Course Code	**ARP 301**	
2	Course Title	Personality Development and Decision making Skills	
3	Credits	2	
4	Contact Hours (L-T-P)	1-0-2	
5	Course Objective	To enhance holistic development of students and improve their employability skills. Provide a 360 degree exposure to learning elements of Business English readiness program, behavioural traits, achieve softer communication levels and a positive self-branding along with augmenting numerical and altitudinal abilities. To up skill and upgrade students' across varied industry needs to enhance employability skills. By the end of this semester, a student will have entered the threshold of his/her 3rd phase of employability enhancement and skill building activity exercise.	
6	Course Outcomes	CO1: *Understanding Personality and its traits | The art of impression management* CO2: *Personality Development and Transformation - Value & Ethics - Contribution to the society.* CO3: *Behavioural and Interpersonal Skills* CO4: *Avoiding Arguments | The Art of Assertiveness* CO5: *Argument Handling - Verbal & Writing Skills* CO6: *The 4M Model | Verbal Abilities-3* CO7: *Level 3 of Quant , Aptitude and Reasoning abilities*	
7	Course Description	This bundles Training approach attempts to explore the personality, character, and the natural style of the student. This helps to develop character, personality, confidence and interpersonal abilities within the student along with level 3 readiness in quant, aptitude and reasoning skills	
8	Outline syllabus – ARP301		
	Unit 1	**Impress to Impact**	**CO MAPPING**
	A	What is Personality?|Who Am I? Creating a positive impression - The 3 V's of Impression | Individual Differences and Personalities	CO1
	B	Personality Development and Transformation - Value & Ethics| Building Self Confidence | Behavioural and Interpersonal Skills (My contribution towards society/ nation)	CO2, CO3
	C	Avoiding Arguments – Essay Writing | The Art of Assertiveness | The Personal Effectiveness Grid | Assessing our Strengths & Limitations and Creating an Action Plan for Learning with the 4M Model | Verbal Abilities-3	CO4, CO5, CO6,

	Unit 2	**Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical**	
	A	Numbers & Digits , Mathematical Operations | Analytical Reasoning	CO7
	B	Cubes & Cuboids | Statement & Assumptions	CO7
	C	Strong & Weak Argument	CO7
	Unit 3	**Quantitative Aptitude**	
	A	Work & Time ,Pipes & Cistern	CO7
	B	Time ,Speed & Distance, Quadratic & Linear Equations, Logs & Inequalities	CO7
	C	Sequence & Series, Logarithms, Data Interpretation | Data sufficiency - Level 1	CO7
	Weightage Distribution	*(CA)Class Assignment/Free Speech Exercises / JAM – 60% | (ETE) Group Presentations/Mock Interviews/GD/ Reasoning, Quant & Aptitude – 40%*	
	Text book/s*	*Wiley's Quantitative Aptitude-P Anand | **Quantum CAT - Arihant Publications | Quicker Maths- M. Tyra |** Power of Positive Action (English, Paperback, Napoleon Hill) | Streets of Attitude (English, Paperback, Cary Fagan, Elizabeth Wilson) The 6 Pillars of self-esteem and awareness - Nathaniel Brandon | Goal Setting (English, Paperback, Wilson Dobson*	

Syllabus: CSP 350, Design and Analysis of Algorithm Lab

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester:V**	
1	Course Code	CSP 350	
2	Course Title	Design and Analysis of Algorithm Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	Objective of this course is to • Reinforce basic design concepts (e.g., pseudocode, specifications, top-down design) • Knowledge of algorithm design strategies • Familiarity with an assortment of important algorithms. • Enable students to analyze time and space complexity	
6	Course Outcomes	Students will be able to: **CO1:** Analyze the asymptotic performance of algorithms **CO2**: Write rigorous correctness proofs for algorithms. **CO3:** Demonstrate a familiarity with major algorithms and data structures **CO4:** Apply important algorithmic design paradigms and methods of analysis	
7	Course Description	This course introduces concepts related to the design and analysis of algorithms. Specifically, it discusses recurrence relations, and illustrates their role in asymptotic and probabilistic analysis of algorithms. It covers in detail greedy strategies divide and conquer techniques, dynamic programming and max flow - min cut theory for designing algorithms, and illustrates them using a number of well-known problems and applications.	
8	Outline syllabus		CO Mapping
	Unit 1	**Practical based on algorithm design by brute force and divide and conquer paradigm**	CO1, CO2, CO4
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 2	**Practical related to dynamic programming paradigm**	CO1, CO2. CO3, CO4
		Sub unit - a, b and c detailed in Instructional Plan	
	Unit 3	**Practical related to greedy method**	CO2, CO3, CO4
		Sub unit - a, b and c detailed in Instructional Plan	

	Unit 4	**Practical related to advanced data structures**			CO2, CO3, CO4
		Sub unit - a, b and c detailed in Instructional Plan			
	Unit 5	**Practical related to string matching algorithms**			CO1, CO2, CO3, CO4
		Sub unit - a, b and c detailed in Instructional Plan			
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	-			
	Other References				

Syllabus: CSP 395, Technical Skill Enhancement Course-1 (Simulation Lab)

School: SET		**Batch: 2019-2023**		
Program: B.TECH		**Current Academic Year: 2019-2020**		
Branch:CSE		**Semester: V**		
1	Course Code	CSP 395	Technical Skill Enhancement Course-1 (Simulation Lab)	
2	Course Title	Simulation Lab		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Lab		
5	Course Objective	• Demonstrate basic programming skills – functions, arrays, loops, conditional statements, procedures • Demonstrate technical communication skills: Create a comprehensive report and an oral presentation with accurate visual representations of a model and its results.		
6	Course Outcomes	Students will be able to: **CO1:** Students will apply MATLAB Programming to solve real life problem. **CO2:** implement the mathematical representation of the model. **CO3:** create a simulation in a computational tool in Matlab **CO4:** Utilize Matlab as a computational tool		
7	Course Description	This course introduces the concepts of MATLAB programing, Modelling and simulation to identify the problems, and choose the relevant models and algorithms to apply.Matlab is used for scientific applications involving images, sound, and other signals.		
8	Outline syllabus			CO Mapping
	UNIT-I	**Introduction**		
	A	Introduction to MATLAB, Basic Commands, Variables and Operators, Logical Operators and their Control flow, Algorithm		CO1, CO2
	B	MATLAB conditional statements		CO1, CO2
	C	MATLAB loops, Solve a problem for one case, then iterate (Take care of middle, then first and last)		
	UNIT-2	**Structures and Cell arrays**		
	A	Structures, Properties, Declaration of Structure, Definition, Accessing Elements from structure, Use of Structure		CO2,CO3

	B	Array, Cell Array, Array operation, Cell Array Operations, Introduction Complexity, Divide and conquer.			CO2
	C	Scripts and Functions			CO3
	UNIT-3	**Review of Mathematical Operations**			
	A	Mathematical operations on sequences: Convolution, graphical and analytical techniques			CO2
	B	Overlap and add methods, matrix method, some examples and solutions of LTI systems,			CO2
	C	MATLAB examples			CO1,CO3
	UNIT-4	**Modeling**			
	A	Stochastic models, Curve fitting, Graphing data in MATLAB			CO4
	B	Accuracy and precision in modeling			CO1, CO2
	C	Verification and validationProject on Simulation based			CO1, CO2
	UNIT-V	**Matlab Applications**			
	A	Working with Sound, Working with Images			CO2, CO4
	B	File, Types of File, file Input/Output Operations, Reading and Writing files, Building GUI's			CO1, CO2
	C	Recursion, Compression			CO1, CO3
	UNIT-5	**Visualization**			
	A	Stochastic models, Curve fitting,			CO4
	B	Graphing data in MATLAB			CO4
	C	Accuracy and precision in modeling			CO4
	Mode of examination	Verification and validationProject on Simulation based			
	Weightage Distribution	Project on Simulation based	ETE		
		60 %	40%		
	Text book/s*				
	Other References	1.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** Students will apply MATLAB Programing to solve real life problem.	PO1,PO2,PO3,PO4,PSO1

2.	**CO2:** implement the mathematical representation of the model.	PO1, PO3, PO4, PSO2
3.	**CO3:** create a simulation in a computational tool in Matlab	PO1,PO2,PO3,PO4
4.	**CO4:** Utilize Matlab as a computational tool -	PO9, PO10,PO11, PSO5

PO and PSO mapping with level of strength for Course NameSimulation Lab (Course Code CSP 302)

1-Slight (Low) 2-Moderate (Medium) 3-Substantial (High)

COs	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO9	PO 10	PO1 1	PO 12	PSO 1	PSO2	PSO3	PS O4	PSO5
CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

Syllabus: CSP 397, Project Based Learning(PBL)-3

School: SET		**Batch: 2019-2023**		
Program: B.Tech		**Current Academic Year: 2019-2020**		
Branch: CSE		**Semester: 5th**		
1	Course Code	**CSP397**	Course Name: Project Based Learning -3	
2	Course Title	Project Based Learning – 3		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory		
5	Course Objective	4. To align student's skill and interests with a realistic problem or project 5. To understand the significance of problem and its scope 6. Students will make decisions within a framework		
6	Course Outcomes	Students will be able to: CO1: Acquire practical knowledge within the chosen area of technology for project development CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach CO3: To prepare the designs requirements, functional and concept design. CO4: Develop effective communication skills for presentation of project related activities CO5: Contribute as an individual or in a team in development of technical projects CO6: Prepare a technical report based on the project.		
7	Course Description	In PBL-3, the students will learn how to define the problem for developing projects, identifying the skills required to develop the project based on given a set ofspecifications and all subjects of that Semester.		
8	Outline syllabus			CO Mapping
	Unit 1	Problem Definition,Team/Group formation and Project Assignment.		CO1, CO2
	Unit 2	Description and design of the proposed project using ER Diagrams.Specifying resource requirement, if any.		CO1, CO2
	Unit 3	Implementation work under the guidance of a faculty member.		CO1, CO2, CO3
	Unit 4	Demonstrate and execute Project with the team.		CO3, CO4
	Unit 5	The presentation, report, work done during the term supported by the documentation, forms the basis of assessment.		CO4, CO5, CO6

		Report should include Abstract, Introduction, Proposed System Design/Algorithm, Experimentation & Result Analysis, Conclusion, and References. Presentation – PBL-3			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		60%	NA	40%	
	Text book/s*				
	Other References				

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO)
1.	CO1: Acquire practical knowledge within the chosen area of technology for project development	PO1, PO2, PO4, PO9, PO10, PO11, PO12
2.	CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach	PO1, PO2, PO4, PO7, PO9, PO10, PO11, PO12
3.	CO3: Discuss and accumulate the background information	PO1, PO2, PO5, PO9, PO10, PO11, PO12
4.	CO4: Develop effective communication skills for presentation of project related activities	PO1, PO2, PO6, PO9, PO10, PO11, PO12
5.	CO5: Contribute as an individual or in a team in development of technical projects	PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12
6.	CO6: Prepare a technical report based on theproject.	PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12

PO and PSO mapping with level of strength for Course Name Project Based Learning -3 (Course Code CSP397)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	-	-	-	3	3	2	3
CO2	3	2	-	3	-	-	2	-	3	3	2	3
CO3	3	2	-	-	2	-	-	-	3	3	2	3
CO4	3	3	-	-	-	2	-	-	3	3	2	3
CO5	3	3	2	2	2	2	3	3	3	3	2	3
CO6	3	3	2	2	2	2	3	3	3	3	2	3

Syllabus: CSP 399, Summer Internship-II

School: SET		**Batch: 2019-2023**	
Program:B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester:V**	
1	Course Code	CSP399	Course Name
2	Course Title	Industrial Internship-II	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	UG	
5	Course Objective	1. Experience the activities and functions of business professionals. 2. Develop and refine oral and written communication skills. 3. Identify areas for future knowledge and skill development.	
6	Course Outcomes	CO1. Experience of applying existing engineering knowledge in similar or new situations CO2. Ability to identify when new engineering knowledge is required, and apply it CO3. Ability to integrate existing and new technical knowledge for industrial application. CO4. Knowledge of contemporary/engineering practice. CO5. Use of acquired techniques, skills, and modern engineering tools necessary for engineering practice. CO6. Ability to work on multi-disciplinary teams.	
7	Course Description	An internship experience provides the student with an opportunity to explore career interests while applying knowledge and skills learned in the classroom in a work setting. The experience also helps students gain a clearer sense of what they still need to learn and provides an opportunity to build professional networks.	
8	Outline syllabus		CO Mapping
	Unit 1	Define objectives and conditions for the internship, ensuring students that it is related to the study path carried out at the University. Specify the names of the university supervisor, the Host Organization supervisor and the duration, the period in which the internship will be carried out and any changes in duration	**CO1**
	Unit 2	The internship work plan is drawn up in consultation with the student, the supervising faculty at the university and the internship supervisor for the organisation offering the internship.	**CO2**
	Unit 3	Project during Internship involves: a) project activated by the Program Director / Host Organization. b) Project activity to be monitored by faculty members at the University. This activity must guarantee continuous presence and continuity to activities related to project.	**CO2,CO3**

	Unit 4	Submission of evaluation form and final report completed by the intern.			**CO4**
	Unit 5	Final evaluation form completed by the supervisor at the Host Organization and final presentation before departmental committee.			**CO5,CO6**
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	NIL	40%	
	Text book/s*	NA			
	Other References	NA			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1. Experience of applying existing engineering knowledge in similar or new situations	PO1, PO2, PO12, PSO4
2.	CO2. Ability to identify when new engineering knowledge is required, and apply it	PO1, PO12, PSO1, PSO4
3.	CO3. Ability to integrate existing and new technical knowledge for industrial application	PO1, PO2, PO12, PSO2, PSO4
4.	CO4. Knowledge of contemporary/engineering practice.	PO1,PO12, PSO 2,PSO4
5.	CO5. Use of acquired techniques, skills, and modern engineering tools necessary for engineering practice.	PO1,PO6,PO8,PO12, PSO 2,PSO4
6.	CO6. Ability to work on multi-disciplinary teams.	PO1,PO7,PSO2

PO and PSO mapping with level of strength for Industrial Internship-II(Course Code CSP 399)

Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PSO 3	PS O4	PS O5
CO1	3	2	-	-	-	-	-	-	-	-	-	3	3	-	-	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	3	-	3	-	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	3	-	2	-	3	-
CO4	3	-	-	-	-	-	-	-	-	-	-	3	-	3	-	2	-
CO5	3	-	-	-	-	2	-	2	-	-	-	3	-	3	-	3	-
CO6	3	-	-	-	-	-	2	-	-	-	-	-	-	2	-	-	-

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: CSE 352, Web Technologies

School: SET		**Batch: 2019-2023**	
Program: Btech		**Current Academic Year: 2019-2020**	
Branch:CSE		**Semester:6**	
1	Course Code	CSE352	Course Name
2	Course Title	Web Technologies	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
	Course Status	Compulsory	
5	Course Objective	Provide the knowledge to design and develop web application with and without database. Students will gain the skills and project-based experience needed for entry into web application and development careers. It provides information about web technologies that relate to the interface between web servers and their clients.	
6	Course Outcomes	On successful completion of this module students will be able to: 1. Design interactive web pages 2. Design web pages/site having validation on user data access. 3. Develop web site for small business and organization or for individual 4. Client server communication RMI	
7	Course Description	The purpose of this course is to give students the basic understanding of how different computers and devices to communicate and share resources as well as to give the basic overview of the different technologies.	
8	Outline syllabus		CO Mapping
	Unit 1	**INTRODUCTION TO HTML & JAVA SCRIPT**	
	A	HTML basic tags, various links implementation, image map, table formatting, form design.	CO1
	B	**Java Script:** Introduction, syntax, comment, statement, variable, operators, Conditional statements, looping statements	CO2
	C	Functions, object, events, Accessing form elements, validating form elements	CO2
	Unit 2	**XML**	
	A	Introduction, syntax, well form XML document, DTD, schema	CO1,CO3
	B	XML Processors/Parser: DOM and SAX	CO1,CO3
	C	XML Technology: xlink, xpath, xpointer, xslt , displaying XML file data into HTML file	CO1,CO3
	Unit 3	**JAVA APPLET & SERVLET**	
	A	Introduction to Applet , Creation of applet,Managing Applets	CO1,CO3
	B	Introduction to JDBC and its Components,Implementing JDBC in Applet.	CO1,CO3
	C	Servlet, Creating Servlet, Managing request and response in Servlet, Servlet Collaboration, Session Tracking	CO1,CO3
	Unit 4	**JAVA SERVER PAGES & ENTERPRISE JAVA BEANS**	
	A	Introduction to JSP , Life cycle of JSP,JSP Application Design	CO3
	B	Scripting elements, scriptlet tag, expression tag, declaration tag, Implicit Objects, JSP Objects, Directive Elements	CO3

	C	EJB - Introduction, Components of EJB, Architecture of EJB			CO3
	Unit 5	**RMI AND JAVA NETWORKING**			
	A	Remote Method Invocation - Introduction, Structure of RMI, Implementing RMI			CO4
	B	Sockets: Introduction, Application, TCP socket, UDP socket			CO4
	C	Socket Implementation, Client and Server sockets, data transmission over socket			CO4
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Ivan Bayross,"HTML,DHTML, JavaScript, Perl & CGI", BPB Publication 2. Schildt H, "The Complete Reference JAVA2", TMH 3. Schildt H, "The Complete Reference J2EE", TMH			
	Other References	1. Rick Delorme," Programming in HTML5 with JavaScript and CSS3", Microsoft			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1:Design interactive web pages by applying CSS .	PO3,PO5,PO8,PO12,PS01,PSO3,PSO4
1.	CO2: Design web page which has animation and dynamic data	PO3,PO5,PO8,PO10,PSO3,PSO4
2.	CO3: Design web pages/site having validation on user data access. .	PO3,PO4,PO5,PO8,PO10, PS01,PSO3,PSO4
3.	CO4: Develop web site for small business and organization or for individual	PO3,PO4,PO5,PO8,PO10, PO12,PSO3,PSO4

PO and PSO mapping with level of strength for Course Web Technologies (Course Code CSE 352)

Cos	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO10	PO 11	PO12	PS O1	PSO2	PSO3	PSO4
CO1	1	-	3	1	3	2	-	3	2	2	2	3	3	-	3	3
CO2	2	-	3	2	3	2	-	3	1	3	2	3	2	-	3	3
CO3	1	-	3	3	3	2	-	3	1	3	2	3	3	-	3	3
CO4	2	-	3	3	3	2	-	3	2	3	2	3	2	-	3	3

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: CSE 353, Compiler Design

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch:CSE		**Semester: V**	
1	Course Code	**CSE 353**	Course Name
2	Course Title	**Compiler Design**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	1. To provide students with an overview of the issues that arise in Compiler construction as well as to throw light upon the significant theoretical developments and tools that are deep rooted into computer science. 2. To introduce the major phases of Compiler construction and also its theoretical aspects including regular expressions, context-free grammars, Finite Automata etc.	
6	Course Outcomes	After the successful completion of this course, students will be able to : **CO 1:** Employ formal attributed grammars for specifying the syntax and semantics of programming languages. **CO 2:** Apply regular patterns and grammars. **CO 3:** Comprehend the working knowledge of the major phases of compilation, particularly lexical analysis, parsing, semantic analysis, and code generation. **CO 4:** Implement parsing and translation techniques for automation of computing tasks. **CO 5:** Design and write a complex programming project on system software.	
7	Course Description	To provide students with an overview of the issues that arise in Compiler construction as well as to throw light upon the significant theoretical developments and tools that are deep rooted into computer science.	
8	Outline syllabus		CO Mapping
	Unit 1	Introduction	
	A	Introduction to Compiler, Phases and passes,	CO1, CO2

		Bootstrapping, Cross-Compiler			
	B	Finite state machines and regular expressions and their applications to lexical analysis			CO1, CO2
	C	lexical-analyzer generator, Lexical Phase errors			CO1, CO2
	Unit 2	**Parsing Techniques**			
	A	The syntactic specification of programming languages: Context free grammars, derivation and parse trees.			CO1, CO2
	B	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers. Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables			CO1, CO2
	C	Constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars. Syntactic phase errors and semantic errors.			CO1, CO2
	Unit 3	**Syntax Directed Translations And Intermediate Code Generation**			
	A	Syntax directed definition, Construction of syntax trees, syntax directed translation scheme			CO3,CO4
	B	Variants of Syntax Trees, Three Address Codes			CO3,CO4
	C	Translation of Expression, Type Checking and control flow.			CO3,CO4
	Unit 4	**Symbol table**			
	A	Data structure for symbols tables, representing scope information.			CO3,CO4
	B	Run-Time Administration: Implementation of simple stack allocation scheme			CO3,CO4
	C	Run Time Storage Management			CO3,CO4
	Unit 5	**Code Generation And Optimization**			
	A	Sources of Optimization of basic blocks and flow graphs			CO5,CO6
	B	Basic Blocks, Flow graphs, DAG			CO5,CO6
	C	Global Data Flow Analysis			CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. 1.Aho, Sethi, Ulman, compilers Principles, Techniques, and Tools, Pearson Education, 2003			
	Other References	1. Lauden, Principles of Compiler Construction. 2. D. M. *Dhamdhere Compiler* Construction--Principles and Practice, Macmillan India,			

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Beyond Boundaries

<u>CO and PO Mapping</u>

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:CO1:** Employ formal attributed grammars for specifying the syntax and semantics of programming languages.	PO1,PO2,PO3,PO4,PSO1
2.	**CO2** Apply regular patterns and grammars.	PO1, PO3, PO4, PSO2
3.	**CO3:** Comprehend the working knowledge of the major phases of compilation, particularly lexical analysis, parsing, semantic analysis, and code generation.	PO1,PO2,PO3,PO4
4.	**CO4:** Implement parsing and translation techniques for automation of computing tasks.	PO9, PO10,PO11, PSO5
5.	**CO5**: Design and write a complex programming project on system software.	PO1,PO2,PO3,PO4,PSO1

PO and PSO mapping with level of strength for Course Name Compiler Design (Course Code CSE 353)

COs	PO1	PO 2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO10	PO 11	PO12	PS O1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3
CO5	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

1	Course Code	**CSE032**
2	Course Title	**Cryptography and Network Security**
3	Credits	**3**
4	Contact Hours	**3-0-0**
5	Course Objective	
6	Course Outcomes	
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	**Introduction& symmetric Key Cryptography**
8.02	Unit A Topic 1	Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security
8.03	Unit A Topic 2	Classical encryption techniques- Substitution Cipher(Mono-alphabetic, Poly-alphabetic), Transposition cipher, Stegnography
8.04	Unit A Topic 3	Block Cipher- Encryption Principles, DES and its variants, strength of DES
8.05	Unit B	**Mathematics of Cryptography**
8.06	Unit B Topic 1	Eucledian, Extended Eucledian Algorithm, EuilersTotient Function , Ferment little Theorem, Eulers theorem
8.07	Unit B Topic 2	Primality Testing-Miller Rabin test, Chinese Remainder Theorem
8.08	Unit B Topic 3	Exponential- square and multiply method, Discrete Logarithm
8.09	Unit C	**Asymmetric Cryptography & Key Exchange**
8.10	Unit C Topic 1	Public Key cryptography-RSA, Cryptanalysis of RSA
8.11	Unit C Topic 2	Elgamal cryptography, Elliptic Curve cryptography
8.12	Unit C Topic 3	Key Management and distribution : KDC, Diffie Hellman Key Exchange
8.13	Unit D	**Digital signatures**
8.14	Unit D Topic 1	User Authentication protocol- Kerberos
8.15	Unit D Topic 2	Digital Signature –RSA, Elgamal, DSS
8.16	Unit D Topic 3	Data integrity algorithms-Hash Functions, MD5, SHA-512
8.17	Unit E	**Security**
8.18	Unit E Topic 1	Security at Application layer-Email Architecture, S/MIME, PGP-Scenarios, key rings
8.19	Unit E Topic 2	Security at Transport layer-SSL(Services, Protocols)
8.20	Unit E Topic 3	Security at Network layer-IPSec(Modes, Security Protocols-AH, ESP, Services provided by IPSEC)
10	**Reading Content**	
9.1	Text book*	5. Stallings, W., “Cryptography and Network Security – Principles and Practices”, Prentice Hall of India, Fourth Edition.
9.2	other references	1. Bruce Schneier, “Applied Cryptography”, John Wiley & Sons Inc, 2001. 2. Behrouz A. Forouzan, “Cryptography And Network Security”- McGraw Hill 3. Internet as a resource for reference

1	Course number	**CSE041**	
2	Course Title	**SOFTWARE PROJECT MANAGEMENT**	
3	Credits	3	
4	Contact Hours (L-T-P)	(3-0-0)	
5	Course Objective	To provide fundamental skills of software Project management emphasising on issues & hurdles associated with delivering successful projects, so as to make student aware of best project management practices, and contemporary software engineering tools.	
6	Course Outcomes	After successful completion of this course students should be able to: 1. Establish the process of software project management and its applications. 2. Evaluate a project & to develop the scope of work. 3. Provide accurate cost estimates and plan the various activities. 4. Develop Software projects according to quality standards.	
7	Outline syllabus:		
7.01	CSE427.A	Unit A	**INTRODUCTION**
7.02	CSE427.A1	Unit A Topic 1	Introduction to software project management, Stages of Software Project Management ,software projects versus other types of project
7.03	CSE427.A2	Unit A Topic 2	Categorization of software projects, Stake holders, setting objectives, WBS,PBS
7.04	CSE427.A3	Unit A Topic 3	Management control, Business case, Project success and failures, Software Tools for Project Management.
7.05	CSE427.B	Unit B	**PLANNING PHASE**
7.06	CSE427.B1	Unit B Topic 1	Introduction to project planning, types of project plan, elements, purpose of project plan
7.07	CSE427.B2	Unit B Topic 2	Step-wise project planning.
7.08	CSE427.B3	Unit B Topic 3	Development Lifecycle models: waterfall, Spiral, Iterative, incremental, v-shaped.
7.09	CSE427.C	Unit C	**PROJECT SCHEDULING**
7.10	CSE427.C1	Unit C Topic 1	Time management, Project Activity Definition, Activity sequencing, Activity Duration estimates
7.11	CSE427.C2	Unit C Topic 2	Project network, Project networking Models
7.12	CSE427.C3	Unit C Topic 3	CPM and PERT
7.13	CSE427.D	Unit D	**PROJECT COST ESTIMATION & PROJECT EVALUATION**
7.14	CSE427.D1	Unit D Topic	Importance and principles of Cost management, Cost Estimation

		1	Process, Earned value analysis
7.15	CSE427.D2	Unit D Topic 2	Software sizing: LOC, Function points, Cost Estimation Methods.
7.16	CSE427.D3	Unit D Topic 3	COCOMO, NPV, ROI, Payback, IRR.
7.17	CSE427.E	Unit E	**QUALITY PROJECT MANAGEMENT**
7.18	CSE427.E1	Unit E Topic 1	Introduction to quality project management, Phases
7.19	CSE427.E2	Unit E Topic 2	SICMM: Structure of CMM, Five maturity levels
7.20	CSE427.E3	Unit E Topic 3	Software process Framework for the CMM
8	Course Evaluation		
8.1	Course work: 30 marks		
8.11	Attendance	None	
8.12	Homework	10 Assignment (no Marks)	
8.13	Quizzes	7 best quiz (20 marks)	
8.14	Projects	None	
8.15	Presentations	10 marks	
8.16	Any other	None	
8.2	MTE	20 marks	
8.3	End-term examination: 50 marks		
9	References		
9.1	Text book	1. Kathy Schwalbe, "Information Technology Project Management" International Student Ed. THOMSON Course Technology 2. Cottrell M. and Hughes B., "Software Project Management", 5th Edition, The McGraw-Hill Companies.	
9.2	other references	1. Manish Kumar JHA "Software Project Management" 3rd Edition, Dhanpat Rai and Co. 2. QuantumPM, "Microsoft Office Project Server 2003 Unleashed", Pearson Education India. 3. Robert T. Futrell, Donald F. Shafer and Linda I Shafer, "Quality Software Project" Pearson India. http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Soft%20Engg/New_index1.html http://ocw.mit.edu/courses/aeronautics-and-astronautics/16-355j-software-engineering-concepts-fall-2005/lecture-notes/	

1	Course number	CSE042	
2	Course Title	SOFTWARE TESTING	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
5	Course Objective	The primary objective of this course is to introduce and instruct software testing and Quality assurance concepts, strategies, and techniques in order to develop a total understanding of the testing process and how it impacts the software project.	
6	Course Outcomes	On successful completion of this module students will be able to 1. Perform functional and non-functional testing 2. Design test case and make test case report 3. Locate bugs and analyze their impact 4. Perform control flow and data flow testing 5. Memorize how to effectively plan your tests, communicate the bugs you find, and measure your success as a software tester 6. Assess various test automation tools available in market and choose appropriate tool for kinds of testing	
7	Outline syllabus		
7.01	CAP707.A	Unit A	Introduction
7.02	CAP707.A1	Unit A Topic 1	Human and errors, Testing Objectives, Principles of Testing, Behaviour and Correctness, Debugging and its techniques
7.03	CAP707.A2	Unit A Topic 2	Software metrics, Software Testing Life Cycle, Testing activities and Levels, Testing myths and facts
7.04	CAP707.A3	Unit A Topic 3	Testing exit criteria, Bug defect life cycle, White Box and Black Box Testing
7.05	CAP707.B	Unit B	Unit Testing
7.06	CAP707.B1	Unit B Topic 1	Concept of Unit Testing, Static Unit Testing, Defect Prevention, Dynamic Unit Testing, Mutation Testing
7.07	CAP707.B2	Unit B Topic 2	Control Flow Testing: Overview of Control Flow Testing, Control Flow Graph, Paths in a Control Flow Graph
7.08	CAP707.B3	Unit B Topic 3	Path Selection Criteria, Regression testing , Agile testing
7.09	CAP707.C	Unit C	Data Flow & Performance testing
7.10	CAP707.C1	Unit C Topic 1	Data Flow Anomaly, Overview of Dynamic Data Flow Testing, Data Flow Graph, Data Flow Terms
7.11	CAP707.C2	Unit C Topic 2	Data Flow Testing Criteria, Comparison of Data Flow Test Selection Criteria, Feasible Paths and Test Selection Criteria
7.12	CAP707.C3	Unit C Topic 3	Integration Testing: Integration Testing, Integration Techniques , Performance testing: Stress , Load , Volume
7.13	CAP707.D	Unit D	Functional Testing
7.14	CAP707.D1	Unit D Topic 1	Equivalence Class Partitioning, Boundary Value Analysis,

			Decision Tables, Random Testing, Error Guessing, Category Partition
7.15	CAP707.D2	Unit D Topic 2	Test case designing – Test cases, Test case format, Test case designing, Acceptance testing and criteria
7.16	CAP707.D3	Unit D Topic 3	Automation testing**:** Need for automation , categorization of Testing tools, Selection of testing tools, Guidelines for automated testing, Overview of commercial testing tools
7.17	CAP707.E	Unit E	Controlling and Monitoring
7.18	CAP707.E1	Unit E Topic 1	Test metrics and measurements –project, progress and productivity metrics – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM
7.19	CAP707.E2	Unit E Topic 2	Types ofreviews – Developing a review program – Components of Review Plans– Reporting
7.20	CAP707.E3	Unit E Topic 3	Review Results. – evaluating software quality – defect prevention – testing maturity model

8	Course Evaluation	
8.1	Course work: 30 marks	
8.11	Attendance	None
8.12	Homework	10 assignments, no weight
8.13	Quizzes	7 best quizzes (based on assignments) in tutorial hours; 30 marks
8.14	Projects	None
8.15	Presentations	None
8.16	Any other	
8.2	MTE	One, 20 marks
8.3	End-term examination: 50 marks	
9	References	
9.1	Text book	1. SagarNaik&PiyuTripathy, "Software Testing and Quality Assurance: Theory and Practice", Wiley.
9.2	Other references	1. Naresh Chauhan, "Software Testing : Principles and practices", Oxford university press 2. Boris Beizer, "Software Testing Techniques", Dreamtech Press 3. K.K. Aggrawal and Yogesh Singh, " Software Engineering" New Age International Publication

School: SET		**Batch : 2019-23**	
Program: B-TECH		**Current Academic Year: 2019-20**	
Branch: CSE		**Semester: VI**	
1	Course Code	**CSE031**	Course Name: Digital Image Processing
2	Course Title	Digital Image Processing	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	UG	
5	Course Objective	**Students will try to learn:** 7. To study the image fundamentals and mathematical transforms necessary for image processing. 8. To study the image enhancement techniques 9. To study image restoration procedures. 10. To study the image compression procedures	
6	Course Outcomes	Students will be able to: CO-7. ***Recognize*** the fundamental concepts of a digital image processing system. CO-8. ***Formulate*** images in the frequency domain using various transformations. CO-9. ***Perform*** operations for image enhancement and image restoration. CO-10. ***Interpret*** image segmentation and representation techniques. CO-11. ***Design*** Image application for recognitions. CO-12. ***Support*** Computer Vision techniques in intelligent systems.	
7	Course Description	Basic concepts of Digital Image Processing	

8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	**Fundamental of digital image processing:**	CO1,
	B	**Image Enhancement** in Spatial Domain	CO1
	C	Arithmetic/Logic Operations in Image enhancement	CO1
	Unit 2	**Image Enhancement in Frequency Domain**	
	A	Fourier Transform Filters –	CO2
	B	Low-pass filter in frequency domain	CO2
	C	High-pass filter in frequency domain	CO2
	Unit 3	**Image Restoration & segmentation**	
	A	Restoration Process model.	CO3
	B	Segmentation and Region Extraction,	CO3
	C	Edge Detection and Corner Detection.	CO3

	Unit 4	**Color Image Processing**			
	A	Color Models, Color Transformation			CO4
	B	Morphological Image Processing			CO4
	C	Morphological Operations			CO4
	Unit 5	**Application of Digital Image Processing**			
	A	Face Recognition			CO5 ,CO6
	B	Optical character recognition			CO5,CO6
	C	Computer vision			CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.			
	Other References	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.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-1. ***Recognize*** the fundamental concepts of a digital image processing system.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
2.	CO-2. ***Formulate*** images in the frequency domain using various transformations.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
3.	CO-3. ***Perform*** operations for image enhancement and image restoration.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
4.	CO-4. ***Interpret*** image segmentation and representation techniques.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
5.	CO-5. ***Design*** Image application for recognitions.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
6.	CO-6. ***Support*** Computer Vision techniques in intelligent systems.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5

PO and PSO mapping with level of strength for Course Name Digital Image Processing **(Course Code CSE031)**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5

CO1	3	2	3	-	-	-	-	-	-	-	2	1	3	2	2	1	2
CO2	3	2	3	-	-	-	-	-	-	-	2	1	3	2	2	1	2
CO3	3	2	3	-	-	-	-	-	-	-	1	1	2	3	2	1	2
CO4	3	2	3	-	-	-	-	-	-	-	3	2	3	2	1	1	1
CO5	3	2	3	-	-	-	-	-	-	-	3	1	2	2	2	1	3
CO6	3	2	3	-	-	-	-	-	-	-	3	1	2	2	2	1	3

School: SET		Batch : 2019-23 Current Academic Year: 2019-20 Semester: 6th	
1	Course Code	**ARP 302**	
2	Course Title	Campus to Corporate	
3	Credits	2	
4	Contact Hours (L-T-P)	1-0-2	
5	Course Objective	To enhance holistic development of students and improve their employability skills. Provide a 360 degree exposure to learning elements of Business English readiness program, behavioural traits, achieve softer communication levels and a positive self-branding along with augmenting numerical and altitudinal abilities. To up skill and upgrade students' across varied industry needs to enhance employability skills. By the end of this semester, a will have entered the threshold of his/her 4th phase of employability enhancement and skill building activity exercise.	
6	Course Outcomes	CO1: *Understanding basics of Human Resources* CO2: *Role Clarity | KRA | KPI | Understanding JD* CO3: *Conflict Management* CO4: *Art of Communication - Verbal* CO5: *Understanding Personal Branding* CO6: *Relationship Management | Verbal Abilities-4* CO 7: *Resume/ CV Writing | Writing Skills* CO8: *Level-4 Quant & aptitude, Reasoning abilities*	
7	Course Description	This penultimate stage introduces the student to the basics of Human Resources. Allows the student to understand and interpret KRA | KPI and understand Job descriptions. A student also understands how to manage conflicts, brand himself/herself, understand relations and empathise others with level-4 of quant, aptitude and logical reasoning	
8	Outline syllabus – ARP 302		
	Unit 1	**Ace the Interview**	**CO MAPPING**
	A	HR Sensitization (Role Clarity | KRA | KPI | Understanding JD) |	CO1,

		Conflict Management	CO2, CO3
	B	Mock Interviews| GD's| Extempore |JAM| Impromptu speeches| Personal Branding	CO4, CO5
	C	Empathy VS Sympathy | Relationship Management | Verbal Abilities-4	CO6
	D	Resume/ CV Writing | Sentence Correction -Spotting error | Synonyms & Antonyms	CO7
	Unit 2	**Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical**	
	A	Sitting Arrangement & Venn Diagrams | Puzzles | Distribution | Selection	CO8
	B	Direction Sense | Statement & Conclusion | Strong & Weak Arguments	CO8
	C	Analogies, Odd One out | Cause & Effect	CO8
	Unit 3	**Quantitative Aptitude**	CO8
	A	Average , Ratio & Proportions, Mixtures & Allegation	CO8
	B	Geometry-Lines, Angles & Triangles	CO8
	C	Problem of Ages | Data Sufficiency - L2	CO8
	Weightage Distribution	*(CA)Class Assignment/Free Speech Exercises / JAM – 60% | (ETE) Group Presentations/Mock Interviews/GD/ Reasoning, Quant & Aptitude – 40%*	
	Text book/s*	*Wiley's Quantitative Aptitude-P Anand* | ***Quantum CAT - Arihant Publications | Quicker Maths- M. Tyra |*** *Power of Positive Action (English, Paperback, Napoleon Hill)* | *Streets of Attitude (English, Paperback, Cary Fagan, Elizabeth Wilson) The 6 Pillars of self-esteem and awareness - Nathaniel Brandon* | *Goal Setting (English, Paperback, Wilson Dobson*	

Syllabus: CSP 352, Web Technologies Lab

School: SET		**Batch: 2019**	
Program: BTECH		**Current Academic Year:**	
Branch:CSE		**Semester: VII**	
1	Course Code	**CSP352**	
2	Course Title	Web Technologies Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Provide the knowledge to design and develop web application with and without database. Students will gain the skills and project-based experience needed for entry into web application and development careers. It provides information about web technologies that relate to the interface between web servers and their clients.	
5	Course Objective	On successful completion of this module students will be able to: 1. Design interactive web pages 2. Design web pages/site having validation on user data access. 3. Develop web site for small business and organization or for individual 4. Client server communication RMI	
6	Course Outcomes	This course is an overview of the modern Web technologies used for the Web development. The purpose of this course is to give students the basic understanding of how different computers and devices to communicate and share resources as well as to give the basic overview of the different technologies.	
7	Course Description		
8	Outline syllabus		CO Mapping
	Unit 1	**INTRODUCTION TO HTML & JAVA SCRIPT**	
		1. Write HTML code to design College Website 2. Write HTML code to design students registration form 3. Write javascript code to perform validation on above form.	CO1, CO2
	Unit 2	**XML**	
		1. Write a program in XML to create Product Catalog. 2. Write a program for Product Catalog DTD. 3. Write a program to display the XML file data into HTML file.	CO1,CO2
	Unit 3	**JAVA APPLET & SERVLET**	
		1. Write a program to count number of character	CO2,

		in words in the text written in text area. 2. Write a program to draw circle using mouse click event. 3. Write a program to insert and then retrieve name,rollno,and branch rom the database using JDBC	CO3,CO4
	Unit 4	**JAVA SERVER PAGES & ENTERPRISE JAVA BEANS**	
		1. Write a program to create registration form using jsp. 2. Write a program to describe jsp:param,jsp:include and jsp forward action. 3. Write a program to implement EJB	CO1,CO2,CO3
	Unit 5	**RMI AND JAVA NETWORKING**	
		1. Write a program to perform addition using RMI 2. Create Chat application using TCP socket Programming. 3. Write a program in which Client keeps reading input from user and sends to the server until “Over” is typed.	CO3,CO4
	Mode of examination	Jury/Practical/Viva	
	Weightage Distribution	CA: 60% / MTE: 0% / ETE: 40%	
	Text book/s*	1. Ivan Bayross,”HTML,DHTML, JavaScript, Perl & CGI”, BPB Publication 2. Schildt H, “The Complete Reference JAVA2”, TMH 3. Schildt H, “The Complete Reference J2EE”, TMH	
	Other References	4. Rick Delorme,” Programming in HTML5 with JavaScript and CSS3”, Microsoft	

Syllabus: CSP 353, Compiler Design Lab

School: SET		**Batch: 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch:CSE		**Semester:6**
1	Course Code	CSP 353
2	Course Title	Compiler Design Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	1. To provide students with an overview of the issues that arise in Compiler construction as well as to throw light upon the significant theoretical developments and tools that are deep rooted into computer science. 2. To introduce the major phases of Compiler construction and also its theoretical aspects including regular expressions, context-free grammars, Finite Automata etc.
6	Course Outcomes	After the successful completion of this course, students will be able to : **CO 1:** Employ formal attributed grammars for specifying the syntax and semantics of programming languages. **CO 2:** Apply regular patterns and grammars. **CO 3:** Comprehend the working knowledge of the major phases of compilation, particularly lexical analysis, parsing, semantic analysis, and code generation. **CO 4:** Implement parsing and translation techniques for automation of computing tasks. **CO 5:** Design and write a complex programming project on system software.
7	Course Description	To provide students with an overview of the issues that arise in Compiler construction as well as to throw light upon the significant theoretical developments and tools that are deep rooted into computer science.

8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
		1. Write a C program to identify whether a given line is a comment or not. 2. Write a C program to recognize strings under 'a', 'a*b+', 'abb'. 3. Implement the lexical analyser using Lex.	CO1, CO2

	Unit 2	**Parsing Techniques**			
		1. Write a program for constructing of LL (1) parsing for any given language. 2. Write a C program for constructing recursive descent parsing for any given language.			CO1, CO2
	Unit 3	**Syntax Directed Translations And Intermediate Code Generation**			
		1. Implement Program semantic rules to calculate the expression that takes an expression with digits, + and * and computes the value. 2. Program to generate a Intermediate code(3 Address code).			CO3, CO4
	Unit 4	**Symbol table**			CO3, CO4
		Implement symbol table			CO1, CO2
	Unit 5	**Code Generation And Optimization**			
		Implement DAG			CO5,CO
	Mode of examination	Jury/Practical/Viva			
	Weightage Distribution	CA	CO3,CO4	ETE	
		60%		40%	
	Text book/s*	2. 1.Aho, Sethi, Ulman, compilers Principles, Techniques, and Tools, Pearson Education, 2003			
	Other References	3. Lauden, Principles of Compiler Construction. 4. D. M. *Dhamdhere Compiler* Construction--Principles and Practice, Macmillan India,			

Syllabus: CSP 396, Technical Skill Enhancement Course-2(Application Development Lab)

School: SET		Batch: 2019-2023	
Program: BTech		**Current Academic Year: 2019-2020**	
Branch:		**Semester:6**	
1	Course Code	CSP301	
2	Course Title	Technical Skill Enhancement Course-2(Application Development Lab)	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory/Elective	
5	Course Objective	Describe the components and structure of a mobile development frameworks (Android SDK and Eclipse Android Development Tools (ADT)) and learn how and when to apply the different components to develop a working system.	
6	Course Outcomes	On successful completion of the course, the student will: 1. Design App user Interface 2. Perform Event driven programming 3. Implement relational Databases on devices using SQLite 4. Examine the usage of commonly available device sensors while building Android App	
7	Course Description	The course will introduce concepts of the Android platform, Android application components, Activities and their lifecycle, UI design. It will also help students to build applications according to their problem statements.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Android**	
		1. Configuration of android SDK and test run of application on device 2. Create "Hello World" application. That will display "Hello World" in the middle of the screen in the emulator. 3. Develop an Android Application to implement Activity life cycle.	CO1
	Unit 2	**Android UI Components**	CO1
		4. Create a layout of Calculator using Grid layout. 5. Develop an Android Application to implement event listener on above layout. 6. Develop an Android Application to implement implicit	CO1

		intent.	
	Unit 3	**Services and Notification**	
		7. Develop an Android Application to implement Service life cycle 8. Develop an Android Application to implement status bar notification 9. Create a menu with 5 options and selected option should appear in text box	CO1,CO2
	Unit 4	**Working with SQL Lite**	CO1,CO2
		10. Create and Login application as above. On successful login, pop up the message. 11. Create an application to implement Create, Insert and update operation on the database. 12. Create an application to perform Delete and retrieve operation on the database.	CO1,CO2
	Unit 5	**Sensor Device**	
		13. Develop an Android Application to detect availability of all sensors. 14. Develop an Android Application to Fetch data from sensors 15. Develop an Android Application for development of compass application with help of Orientation sensor	CO1
	Mode of examination	Jury/Practical/Viva	
	Weightage Distribution	CA / MTE / ETE 60% / 0% / 40%	
	Text book/s*	1. Anubhav Pradhan and Anil V. Deshpande , Composing Mobile Apps: Learn, Explore, Apply Using Android , 1st Edition, Wiley India.	
	Other References	1. Wei-Meng Lee , Beginning Android 4 Application Development. 2. Neil Smyth ,Android Studio Development essentials-Android 6	

Syllabus: CSP 398, Project Based Learning (PBL) -4

School: SET		**Batch: 2019-2023**		
Program: B.Tech		**Current Academic Year: 2019-2020**		
Branch: CSE		**Semester: 6th**		
1	Course Code	**CSP398**	Course Name: Project Based Learning -4	
2	Course Title	Project Based Learning-4		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory		
5	Course Objective	11. To align student's skill and interests with a realistic problem or project 12. To understand the significance of problem and its scope 13. Students will make decisions within a framework		
6	Course Outcomes	Students will be able to: CO1: Acquire practical knowledge within the chosen area of technology for project development CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach CO3: To design and implementsolutions to open-endedproblem/project. CO4: Develop effective communication skills for presentation of project related activities CO5: To deploy and justify the project and contribute as an individual or in a team in development of technical projects CO6: Use different tools forcommunication, design, implementation, testing andreport writing.		
7	Course Description	In PBL-4, the students will learn how to define the problem for developing projects, identifying the skills required to develop the project based on given a set ofspecifications and all subjects of that Semester.		
8	Outline syllabus			CO Mapping
	Unit 1	Problem Definition,Team/Group formation and Project Assignment. Create Software Requirement Specification		CO1, CO2
	Unit 2	Finalize and present the functional design brief, concept designs and the outline design process results to an outline design report.		CO1, CO2
	Unit 3	Implementation or Coding: the actual coding work of different modules/units is started.		CO1, CO2, CO3
	Unit 4	Test the project modules		CO3, CO4
	Unit 5	Demonstrate and execute Project with the team. The presentation, report, work done during the term supported by the documentation, forms the basis of assessment.		CO4, CO5, CO6
		Report should include Abstract, Introduction, Proposed		

		System Design/Algorithm, Experimentation & Result Analysis, Conclusion, and References. Presentation – PBL-4			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		60%	NA	40%	
	Text book/s*				
	Other References				

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO)
1.	CO1: Acquire practical knowledge within the chosen area of technology for project development	PO1, PO2, PO4, PO9, PO10, PO11, PO12
2.	CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach	PO1, PO2, PO4, PO7, PO9, PO10, PO11, PO12
3.	CO3: Discuss and accumulate the background information	PO1, PO2, PO5, PO9, PO10, PO11, PO12
4.	CO4: Develop effective communication skills for presentation of project related activities	PO1, PO2, PO6, PO9, PO10, PO11, PO12
5.	CO5: Contribute as an individual or in a team in development of technical projects	PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12
6.	CO6: Prepare a technical report based on theproject.	PO1, PO2, PO3, PO4,PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12

PO and PSO mapping with level of strength for Course Name Project Based Learning -4 (Course Code CSP398)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	3	-	-	-	-	3	3	2	3
CO2	3	2	-	3	-	-	2	-	3	3	2	3
CO3	3	2	-	-	2	-	-	-	3	3	2	3
CO4	3	3	-	-	-	2	-	-	3	3	2	3
CO4	3	3	2	2	2	2	3	3	3	3	2	3

CO4	3	3	2	2	2	2	3	3	3	3	2	3

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

1	Course No.	CSE051	
2	Course Title	WIRELESS NETWORKS	
3	Credit	3	
4	Contact Hours	3-0-0 (L-T-P)	
5	Course Objective	To enable students to understand the basic concepts of wireless networks specially MANETs and Sensor networks and apply these concepts for designing, evaluating and comparing wireless networks	
6	Course Outcomes	After successful completion of the course a student should be able to 1 Use the fundamental concepts of the course a student should be able to 2 Differentiate between various type of wireless networks 3 Configure wireless router 4 Differentiate between infrastructure and infrastructure less networks 5 Compare between various MAC, routing and MAC protocols for MANETs using NS2 6 Analyze energy management issue in MANETs 7 Analyze basic issues in sensor networks 8 Compare various MAC and routing protocols in sensor networks 9 Use various tools for sensor networks 10 Establish a sensor networks	
7.01	CSE443.A	Unit A	**FUNDAMENTAL OF WIRELESS NETWORKS**
7.02	CSE443.A1	Unit A Topic 1	Basic Networking Concepts
7.03	CSE443.A2	Unit A Topic 2	Wireless LANs and PANs: Bluetooth, 802.11, and Hiper LAN
7.04	CSE443.A3	Unit A Topic 3	Wireless internet, mobile ip (wi-fi routers)
7.05	CSE443.B	Unit B	**INTRODUCTION TO MANETs**
7.06	CSE443.B1	Unit B Topic 1	Overview of MANETs
7.07	CSE443.B2	Unit B Topic 2	Cellular vs. Ad-hoc networks, issues and challenges
7.08	CSE443.B3	Unit B Topic 3	MAC protocols for ad-hoc networks
7.09	CSE443.C	Unit C	**CHALLENGES IN MANETs**
7.10	CSE443.C1	Unit C Topic 1	Routing protocols for ad-hoc networks, DSR/AODV etc. (NS2)
7.11	CSE443.C2	Unit C Topic 2	Transport protocols for ad-hoc networks
7.12	CSE443.C3	Unit C Topic 3	Energy Management in Ad-Hoc Wireless Networks
7.13	CSE443.D	Unit D	**SENSOR NETWORKS**
7.14	CSE443.D1	Unit D Topic 1	Introduction, Applications and Issues
7.15	CSE443.D2	Unit D Topic 2	Networking Sensors, MAC protocols and Routing protocols
7.16	CSE443.D3	Unit D Topic 3	Infrastructure Establishment Issues
7.17	CSE443.E	Unit E	**CHALLENGES IN SENSOR NETWORKS**

7.18	CSE443.E1	Unit E Topic 1	Tasking and control in sensor networks
7.19	CSE443.E2	Unit E Topic 2	Sensor network plat forms and tools, emerging trends in sensor networks **(SENSE)**
7.20	CSE443.E3	Unit E Topic 3	Establishing sensor network using Zigbee,
7.21	CSE443.E4	Unit E Topic 4	Enabling Technologies For Wireless Sensor Networks.
8	Course Evaluation		
8.1	Course Work: 30 marks		
8.2	MTE	One, 20 percent	
8.3	End-term examination: 50 percent		
8.11	Attendance	None	
8.12	Homework	Three best out of 4 assignments: 20 marks	
8.13	Quizzes	Two 30-minutes surprise quizzes in lecture hours: 10 marks	
8.14	Project	None	
8.15	Presentation	None	
8.16	Any Other	None	
9	References		
9.1	Text Book	1. Ad Hoc Wireless Networks: Architectures and Protocols. C. Siva Ram Murthy, Prentice Hall PTR. 2. Wireless Sensor Networks: An Information Processing Approach, Feng Zhao and Leonidas Guibas, Publisher: Morgan Kaufmann.	
9.2	Other Refrences	1. Ad-hoc networks and sensor networks: Theory and Applications, D.D. Marios, D.P. Agarwal World Scientific.	

School: SET		**Batch : 2019-23**		
Program: B.Tech		**Current Academic Year: 19-20**		
Branch: CSE		**Semester: VII**		
1	Course Code	CSE061	Course Name	
2	Course Title	**Introduction to Internet of Things**		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	UG		
5	Course Objective	• Explain the concept of IoT. • To analyze, design and develop IOT solutions. • To apply the concept of Internet of Things in the real world scenarios.		
6	Course Outcomes	On successful completion of the course, the student will: 1. Understand the concepts of Internet of Things 2. Analyze basic protocols in wireless sensor network 3. Design IoT applications in different domain and be able to analyze their performance 4. Implement basic IoT applications on embedded platform		
7	Course Description	This course introduces Concepts for internet of things and how we can embed it into our daily lives for the development of life style. It will also help students to build applications according to their problem statements.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction to microprocessor**		
	A	Introduction of Microcomputer System: CPU, I/O devices, clock, memory, bussed architecture, tristate logic, address bus, data bus and control bus.		CO1
	B	Semiconductor Memories: Development of semiconductor memory, internal structure and decoding, memory read and write timing diagrams, ROM,EPROM,EEPROM, DRAM,		CO1
	C	Architecture of 8-bit Microprocessor: Intel 8085A microprocessor,Pin description and internal architecture.		CO1, CO2
	Unit 2	**Introduction to microcontroller**		
	A	**8051 Microcontroller Basics**: Inside the Computer, Microcontrollers and Embedded Processors, Block Diagram of 8051, PSW and Flag Bits, 8051 Register Banks and Stack, Internal Memory Organization of 8051,		CO1, CO2
	B	IO Port Usage in 8051, Types of Special Function Registers and their uses in 8051, Pins Of 8051. Memory Address Decoding, 8031/51 Interfacing With External ROM And RAM. 8051 Addressing Modes.		CO1, CO2
	C	**Assembly programming and instruction of 8051:** Introduction to 8051 assembly programming, Assembling and running an 8051 program, Data types and Assembler directives, Arithmetic, logic instructions and		CO1, CO2,CO3

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		programs, Jump, loop and call instructions, IO port programming.	
	Unit 3	**Network & Communication aspects**	
	A	Design Methodology - Embedded computing logic - Microcontroller,	CO1,CO2
	B	System on Chips - IoT system building blocks - Arduino - Board details,.	CO1,CO2
	C	Introduction to - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming	CO2
	Unit 4	**Challenges in IoT**	
	A	Design challenges	CO1,CO2,CO3
	B	Development challenges	CO1,CO2,CO3
	C	Security challenges, Other challenges	CO1,CO2,CO3
	Unit 5	**Domain specific applications of IoT**	
	A	Home automation	CO1,CO2,CO4
	B	Industry applications	CO1,CO2,CO4
	C	Surveillance applications, Other IoT applications	CO1,CO2,CO4
	Mode of examination	Theory	
	Weightage Distribution	CA 30%	MTE 20% / ETE 50%
	Text book/s*	1. Arshdeep Bahga and Vijay Madisetti, "Internet of Things – A Hand-on Approach", Universities press, 2015. 2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2019	
	Other References	1. Charalampos Doukas , "Building Internet of Things with the Arduino", Create space, April 2002 2. Dr. Ovidiu Vermesan and Dr. Peter Friess, "Internet of Things: From research and innovation to market deployment", River Publishers 2014. 3. Contiki : The open source for IOT, www.contiki-os.org	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** Understand the concepts of Internet of Things	PO1,PSO1
2.	**CO2:** Analyze basic protocols in wireless sensor network	PO1,PO2, PO3, PO4, PSO2, PO5,PSO5
3.	**CO3:** Design IoT applications in different domain and be able to analyze their performance	PO2,PSO1
4.	**CO4:** Implement basic IoT applications on embedded platform	PO1, PO3,PO9, PO10,PO11,PO12,PSO3

PO and PSO mapping with level of strength for Course Name Internet of Things (Course CodeCSe061)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CSE	CO1	3	2	--	2	--	2	2	2	--	1	--	2	3	1	1	1	2
	CO2	3	3	3	3	3	1	--	2	2	2	1	2	2	3	2	1	3
	CO3	2	3	2	1	--	--	1	1	1	1	--	1	3	1	1	1	1
	CO4	3	2	3	2	2	2	2	2	3	3	3	3	2	2	3	1	2

1	Course number	**CSE062**	
2	Course Title	**MOBILE COMPUTING**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
5	Course Objective	The objective of the course is to impart knowledge of mobile and wireless computing systems and techniques	
6	Course Outcomes	On successful completion of this module students will be able to: 1. synthesize the basic concepts and principles in mobile computing. 2. analyze the concept of wireless, mobile and sensor networks. 3. synthesize the structure and components for mobile IP and mobility Management. 4. develop algorithms for allocation estimations based on different positioning techniques and platforms. 5. develop and maintain a Wireless LAN 6. identify the important issues and concerns on security and privacy. 7. design and develop mobile applications.	
7	Outline syllabus		
7.01	CSE327.A	Unit A	**INTRODUCTION**
7.02	CSE327.A1	Unit A Topic 1	Wireless transmission , Frequencies for radio transmission
7.03	CSE327.A2	Unit A Topic 2	Signals , Antennas , Signal Propagation , Multiplexing, Modulations
7.04	CSE327.A3	Unit A Topic 3	Spread spectrum, MAC, SDMA , FDMA , TDMA , CDMA , Cellular Wireless Networks
7.05	CSE327.B	Unit B	**TELECOMMUNICATION NETWORKS**
7.06	CSE327.B1	Unit B Topic 1	GSM: Mobile services, System architecture, Radio interface, Protocols
7.07	CSE327.B2	Unit B Topic 2	Localization and calling, Handover, Security
7.08	CSE327.B3	Unit B Topic 3	General Packet Radio Service (GPRS): GPRS Architecture, GPRS network nodes,
7.09	CSE327.C	Unit C	**WIRELESS LANS**
7.10	CSE327.C1	Unit C Topic 1	Introduction to IEEE 802.11b/g/n
7.11	CSE327.C2	Unit C Topic 2	Bluetooth technologies and architecture.
7.12	CSE327.C3	Unit C Topic 3	HIPERLAN, WML programming
7.13	CSE327.D	Unit D	**MOBILE NETWORK LAYER**
7.14	CSE327.D1	Unit D Topic 1	Mobile IP Goals, Entities, IP packet Delivery Agent Advertisement and Discovery, Registration.
7.15	CSE327.D2	Unit D Topic 2	Hidden and exposed terminal problems ,Routing protocols classification,
7.16	CSE327.D3	Unit D Topic 3	DSDV, DSR, AODV **,** Security
7.17	CSE327.E	Unit E	**Mobile Transport Layer & Wireless Application Protocol**
7.18	CSE327.E1	Unit E Topic 1	Traditional TCP, Indirect TCP,

7.19	CSE327.E2	Unit E Topic 2	Snooping TCP, Mobile TCP
7.20	CSE327.E3	Unit E Topic 3	WAP: Protocols, Architecture
8	Course Evaluation		
8.1	Course work: 30 marks		
8.11	Attendance	none	
8.12	Homework	10 assignments, no weight	
8.13	Quizzes	7 best quizzes (based on assignments) in tutorial hours; 30 marks	
8.14	Projects	none	
8.15	Presentations	none	
8.16	Any other		
8.2	MTE	One, 20 marks	
8.3	End-term examination: 50 marks		
9	References		
9.1	Text book*	6. JochenSchiller : Mobile Communication, Pearson Education. 7. U. Hansman and L. Merck : Principles of Mobile Computing", 2nd Ed., Springer	
9.2	other references	1. A. S. Tanenbaum. : Computer Networks, 4th Ed., Pearson Education. 2. D. Milojicic, F. Douglis. : Mobility Processes, Computers and Agents", Addison Wesley 8. D.B. Lange and M. Oshima : Programming and Deploying Java Mobile Agents with Aglets, Addison Wesley.	

1	Course number	**CSE354**
2	Course Title	**ARTIFICIAL INTELLIGENCE**
3	Credits	3
4	Contact Hours	3-0-0
5	Course Objective	The objective of the course is to introduce basic fundamental concepts in Artificial Intelligence (AI), with a practical approach in understanding them. To visualize the scope of AI and its role in futuristic development.
6	Course Outcomes	On successful completion of this module students will be able to • distinguish between AI and non-AI solution, • apply AI techniques in problem solving, • analyse the best search technique and implement it in real-life applications • explore the scope of AI in various application domains
7	Outline syllabus	
7.01	CSE428.A	**INTRODUCTION TO AI**
7.02	CSE428.A1	Foundation of AI, Goals of AI, History and AI course line
7.03	CSE428.A2	Introduction to Intelligent Agents; Environment; Structure of Agent
7.04	CSE428.A3	AI Solutions Vs Conventional Solutions; a philosophical approach; a practical approach
7.05	CSE428.B	**PROBLEM SOLVING AGENTS**
7.06	CSE428.B1	Problem solving using Search Techniques; Problems; Solutions; Optimality
7.07	CSE428.B2	Informed Search Strategies; Greedy Best-First; A* Search; Heuristic Functions
7.08	CSE428.B3	Uninformed Search Strategies; BFS; DFS; DLS; UCS; IDFS; BDS
7.09	CSE428.C	**KNOWLEDGE & REASONING**
7.10	CSE428.C1	Knowledge-Based Agents; Logic; First-Order Logic; Syntax-Semantics in FOL; Simple usage;
7.11	CSE428.C2	Inference Procedure; Inference in FOL; Reduction; Inference Rules;
7.12	CSE428.C3	Forward Chaining; Backward Chaining; Resolution
7.13	CSE428.D	**LEARNING**
7.14	CSE428.D1	Common Sense Vs Learning; Components; Representations; Feedback
7.15	CSE428.D2	Learning Types: Supervised; Unsupervised; Reinforcement Learnings
7.16	CSE428.D3	Artificial Neural Networks: Introduction, types of networks; Single Layer and Multi-Layer n/w.
7.17	CSE428.E	**APPLICATIONS**
7.18	CSE428.E1	AI Present & Future; application case studies on NLP, Image Processing;
7.19	CSE428.E2	Robotics – Hardware; Vision; Navigation based case studies;
7.20	CSE428.E3	Ambient Intelligence case studies;
8	Course Evaluation	
8.1	Course work: 30 marks	
8.11	Attendance	100%
8.12	Homework	Assignments (4)
8.13	Quizzes	5
8.14	Projects	Optional
8.15	Presentations	
8.16	Any other	Posters (optional)
8.2	MTE	One, 20 marks
8.3	End-term examination: 50 marks	
9	References	
9.1	Text book*	9. *Rich E*& Knight K, *Artificial Intelligence,* Tata McGraw Hill, Edition 3.
9.2	other references	1. Russell S &Norvig P, *Artificial Intelligence: A Modern Approach*, Prentice Hall 2. Dan W. Patterson, Artificial Intelligence & Expert Systems, Pearson Education with Prentice Hall India. Indian Edition.

Syllabus:CSP 354, Artificial Intelligence Lab

School: SET		**Batch: 2019-2023**	
Program: B.Tech CSE		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester: VII**	
1	Course Code	CSP354	
2	Course Title	Artificial Intelligence Lab	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Compulsory	
5	Course Objective	The objective is to gain knowledge of basic concepts of artificial intelligence and machine learning.	
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1. Identify the basic components of library environment and installations. CO2. Understand the working of machine learning libraries. CO3. Analyze the significant methodology needs to be applied for data preprocessing. CO4. Develop some application oriented projects on Image Processing, Natural Language Processing etc CO5. Identify how to use github and submit back genuine contributions on the same.	
7	Course Description	Artificial Intelligence Lab covers the hands-on, understanding and analysis of machine learning technology and to trace its recent trend.	
8	Outline syllabus		CO Mapping
	Unit 1	**Library Environment Understanding and installation**	
		1. To install the pypi libraries for Machine Learning. 2. Review of python datatypes for Artificial Intelligence and Machine Learning	CO1
	Unit 2	**Machine Learning Experiments**	
		1. Develop a machine learning model for standard database using Support Vector Machines 2. Develop a machine learning model for standard database using Decision Trees. **3.** Develop a machine learning model for standard database using Random Forest.	CO2
	Unit 3	**Data Preprocessing**	
		1. Deploy standardization and normalization on some standard dataset. **2.** Deploy Principal Component Analysis to extract relevant features on some standard database.	CO3
	Unit 4	**Application Oriented Experiment**	
		1. Develop a decision boundary for facial recognition	CO4

		purpose. 2. Develop a decision boundary to predict the emotions from the human voice.			
	Unit 5	**Industry Oriented Experiments**			
		1. Understanding of github and conda environments. **2.** To use the github packages and libraries to frame a standard project and commit back to github.			CO5
	Mode of examination	Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	1. Russell S &Norvig P, *Artificial Intelligence: A Modern Approach*, Prentice Hall.			
	Other References	1. D. H. Wolpert. The supervised learning no-free-lunch theorems. In Soft Computing and Industry, pages 25–42. Springer, 2002. 2. V. Vapnik. The nature of statistical learning theory. Springer Science & Business Media, 2013. 3. C. J. Burges. A tutorial on support vector machines for pattern recognition. Data mining and knowledge discovery, 2(2):121–167, 1998. 4. J. H. Friedman, J. L. Bentley, and R. A. Finkel. An algorithm for finding best matches in logarithmic expected time. ACM Transactions on Mathematical Software (TOMS), 3(3):209–226, 1977.			

Syllabus: CSP 497, Major Project -1

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester: 7th**	
1	Course Code	**CSP497**	Course Name: Major Project -1
2	Course Title	Major Project -1	
3	Credits	3	
4	Contact Hours (L-T-P)	0-0-0	
	Course Status	Compulsory	
5	Course Objective	14. To align student's skill and interests with a realistic problem or project 15. To understand the significance of problem and its scope 16. To realize the outcome artifacts of the project. 17. Students will make decisions within a framework	
6	Course Outcomes	Students will be able to: CO1: Identify problems in engineering and technology in selected field of interest. Gather and manage the information required to develop a project CO2: Discuss and accumulate the background information CO3: Synthesize and apply prior knowledge of mathematics, computer science and engineering. CO4: To prepare the designs requirements, functional and concept design. CO5: To build and evaluate the modules to verify the required need of the project. CO6: To start the actual implementation of the project work to produce the deliverables. To design and implement solutions to open-ended problem/project.	
7	Course Description	The object of Major Project-I is to enable the student to take up investigative study in the broad field of Computer Science & Engineering, either fully theoretical/practical orinvolving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a Supervisor.	

8	Outline syllabus		CO Mapping
	Unit 1	Problem identification, Literature survey/Gather & analyze information from multiple sources	CO1, CO2
	Unit 2	Formulate solution/ Problem Description: Project Planning, Time and Cost Estimation and budgeting, Risk Management, Project scheduling and Planning Tools: Work Breakdown structure, LRC, Gantt charts, CPM/PERT Networks. Creating System Requirement Specifications (Functional & Non Functional)	CO1, CO2, CO3
	Unit 3	Preparing Design: Data Flow Diagrams & Flow Charts, Use of appropriate tools and techniques for project design	CO2, CO3, CO4
	Unit 4	Identify and Implement Project Modules	CO4, CO5
	Unit 5	Use of appropriate tools/technologies for coding the modules	CO4, CO5,

					CO6
		Report on final problem statement, specifications, project schedule, final concept design and project schedule Report and Presentation - Project Modules development			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		60%	NA	40%	
	Text book/s*				
	Other References				

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO)
1.	CO1: Identify problems in engineering and technology in selected field of interest. Gather and manage the information required to develop a project	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11, PO12
2.	CO2: Discuss and accumulate the background information.	PO1, PO2, PO4, PO7, PO9, PO10, PO11, PO12
3.	CO3: Synthesize and apply prior knowledge of mathematics, computer science and engineering	PO1, PO2, PO3, PO6, PO5, PO9, PO10, PO11, PO12
4.	CO4: To prepare the designs requirements, functional and concept design	PO1, PO2, PO3, PO6, PO7, PO9, PO10, PO11, PO12
5.	CO5: To build and evaluate the prototype to verify the required need of the project.	PO1, PO2, PO3, PO4, PO5, PO7, PO9, PO10, PO11, PO12
6.	To start the actual implementation of the project work to produce the deliverables. To design and implement solutions to open-ended problem/project.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12

PO and PSO mapping with level of strength for Course Name Major Project -1 (Course Code CSP497)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	-	-	2	3	3	2	3
CO2	3	2	3	3	3	-	2	-	3	3	2	3
CO3	3	2	3	-	3	3	-	-	3	3	2	3
CO4	3	2	3	-	-	2	2	-	3	3	2	3
CO5	3	2	3	3	3	-	2	2	2	3	3	3
CO6	3	2	3	3	3	1	3	3	3	3	3	3

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: CSP 499, Summer Internship-III

School: SET		**Batch: 2019-2023**	
Program:B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE		**Semester:VII**	
1	Course Code	CSP499	Course Name
2	Course Title	Summer Internship-III	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-0	
	Course Status	UG	
5	Course Objective	1. Get hands-on experience about real world problems in a field relevant to their major of studies. 2. Acquire confidence for employment after graduation. 3. Acquire skills important for time management, discipline, selflearning 4. Effective communication and so on. Learn practically about team-work, collaboration, and leadership.	
6	Course Outcomes	CO1: Arrive at work as scheduled, ready to work, and stay for the agreed upon time CO2: Present yourself in a professional manner at all times, including being appropriately dressed for your workplace CO 3: Communicate any concerns with your supervisor and the internship coordinator in a timely manner and respectfully CO 4: Demonstrate enthusiasm and interest in what you are doing; ask questions and take initiative as appropriate. CO 5. Exposure to professional and ethical responsibility	
7	Course Description	The Internship aims to offer students the opportunity to apply their knowledge in real-life environments through an industry placement for eight-weeks. It is expected that the skills students will gain from working with an organization will help them perform better on their jobs after graduation. In addition, the Internship greatly increases the chances for students to obtain full time employment after graduation.	
8	Outline syllabus		CO Mapping
	Unit 1	Define objectives and conditions for the internship, ensuring students that it is related to the study path carried out at the University. Specify the names of the university supervisor, the Host Organization supervisor and the duration, the period in which the internship will be carried out and any changes in duration	**CO1**
	Unit 2	The internship work plan is drawn up in consultation with the student, the supervising faculty at the university and the internship	**CO2**

		supervisor for the organisation offering the internship.			
	Unit 3	Project during Internship involves: a) project activated by the Program Director / Host Organization. b) Project activity to be monitored by faculty members at the University. This activity must guarantee continuous presence and continuity to activities related to project.			**CO3,CO6**
	Unit 4	Submission of evaluation form and final report completed by the intern.			**CO3,CO4**
	Unit 5	Final evaluation form completed by the supervisor at the Host Organization and final presentation before departmental committee.			**CO4,CO5**
	Mode of examination	Practical			
	Weightage Distribution	CA	MTE	ETE	
		60%	NIL	40%	
	Text book/s*	NA			
	Other References	NA			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Arrive at work as scheduled, ready to work, and stay for the agreed upon time.	PO1, PO2, PO12, PSO4
2.	CO2: Present yourself in a professional manner at all times, including being appropriately dressed for your workplace	PO1, PO12, PSO1, PSO4
3.	CO 3: Communicate any concerns with your supervisor and the internship coordinator in a timely manner and respectfully	PO1, PO2, PO12, PSO2, PSO4
4.	CO 4: Demonstrate enthusiasm and interest in what you are doing; ask questions and take initiative as appropriate.	PO1, PO12, PSO2, PSO4
18.	CO 5. Exposure to professional and ethical responsibility	PO1, PO6, PO8, PO12, PSO2, PSO4

PO and PSO mapping with level of strength for Summer Internship-III(Course Code CSP 499)

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	-	-	-	-	-	-	-	-	-	3	3	-	-	3	-
CO2	3	2	-	-	-	-	-	-	-	-	-	3	-	3	-	2	-
CO3	3	2	-	-	-	-	-	-	-	-	-	3	-	2	-	3	-
CO4	3	-	-	-	-	-	-	-	-	-	-	3	-	3	-	2	-
CO5	3	-	-	-	-	2	-	2	-	-	-	3	-	3	-	3	-

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

Syllabus: CSP 498, Major Project - 2

School: SET		**Batch: 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-2020**	
Branch: CSE / IT		**Semester: VIII**	
1	Course Code	**CSP498**	Course Name: Major Project -2
2	Course Title	Major Project -2	
3	Credits	8	
4	Contact Hours (L-T-P)	0-0-0	
	Course Status	Compulsory	
5	Course Objective	1. To understand the concept of project design after the completion of project planning 2. Students making decisions within a framework 3. Continuous evaluation of the project 4. A final product to be evaluated for quality	
6	Course Outcomes	Students will be able to: CO1: To identify the test procedure for each implemented module CO2: To perform testing using test techniques associated with the white box and black box test-approach methods CO3: To deploy and justify the project after successful testing CO4: Use different tools forcommunication, testing andreport writing. CO5:Enhancing the technical skill and report writing. CO6: To provide a goodtraining for the students in R&D work and technical leadership.	
7	Course Description	The objective of Major Project-II is to enable the student to extend further the development of project till testing and deployment under the guidance of a Supervisor.	

8	Outline syllabus		CO Mapping
	Unit 1	Testing of the modules, Use of appropriate tools/techniques for testing	CO1, CO2
	Unit 2	Deploy & demonstrate developed modules of the project	CO1, CO2, CO3
	Unit 3	Preparing a Project Report in the standard format for being evaluated by the Supervisor	CO4, CO5, CO6
	Unit 4	Submission of Project and Report to Departmental Committee	CO4, CO5, CO6
	Unit 5	Final Presentation before Departmental Committee	CO6
	Mode of	Theory	

	examination				
	Weightage Distribution	CA	MTE	ETE	
		60%	NA	40%	
	Text book/s*				
	Other References				

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO)
1.	CO1: To start the actual implementation of the project work to produce the deliverables. To design and implementsolutions to open-endedproblem/project.	PO1, PO2, PO3, PO4, PO5, PO8, PO9, PO10, PO11, PO12
2.	CO2: To identify the test procedure for each implemented module	PO1, PO2, PO4, PO7, PO9, PO10, PO11, PO12
3.	CO3: To perform testing using test techniques associated with the white box and black box test-approach methods	PO1, PO2, PO3, PO6, PO5, PO9, PO10, PO11, PO12
4.	CO4: To deploy and justify the project after successful testing	PO1, PO2, PO3, PO6, PO7, PO9, PO10, PO11, PO12
5.	CO5:Use different tools forcommunication, design,implementation, testing andreport writing.	PO1, PO2, PO3, PO4, PO5, PO7, PO9, PO10, PO11, PO12
6.	CO6: To provide a goodtraining for the students in R&D work and technical leadership.	PO1, PO2, PO3, PO4, PO5, PO6, PO7, PO8, PO9, PO10, PO11, PO12

PO and PSO mapping with level of strength for Course Name Major Project -2 (Course Code CSP498)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	3	3	-	-	2	3	3	2	3
CO2	3	2	3	3	3	-	2	-	3	3	2	3
CO3	3	2	3	-	3	3	-	-	3	3	2	3
CO4	3	2	3	-	-	2	2	-	3	3	2	3
CO5	3	2	3	3	3	-	2	2	2	3	3	3
CO6	3	2	3	3	3	1	2	2	2	3	3	3

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

SPECILIZATION	TERM	Course Code	Course	Credits
Artificial Intelligence & Machine Learning	II	CSA102	Introduction To AI & ML	2
	III	CSA201	Concept of Machine Learning	4
	IV	CSA202	Soft Computing	3
	V	CSA301	Computer Vision	3
	VI	CSA302	Introduction to Deep Learning	4
	VII	CSA401	Robotics & Intelligent systems	4
	PE1	CSA011	Expert System	3
	PE2	CSA021	Human Computer Interaction	3
	PE2	CSA022	ML For Health care	3
	PE3	CSA031	Digital Image Processing	3
	PE3	CSA032	Natural Language Processing	3
	PE4	CSA041	Information Retrieval	3
	PE4	CSA042	Neural Networks	3
	PE5	CSA051	ML for Networking	3
	PE5	CSA052	Fuzzy Logic	3
	PE6	CSA061	Intelligent Agent	3
	PE6	CSA062	Recommender Systems	3

School: SET		**Batch : 2019-2023**	
Program: B.TECH		**Current Academic Year: 2019-20**	
Branch: CSE		**Semester: III**	
1	Course Code	CSA201	Course Name
2	Course Title	**Concepts of Machine Learning Lab**	
3	Credits	1	
4	Contact Hours (L-T-P)	0-0-2	
	Course Status	Core	
5	Course Objective	**Students will try to learn:** 1. To introduce the ideas of learning rule and implement them based on human experience. 2. To conceptualize the working of human brain using SVM, RF and ANN. 3. To become familiar with decision boundaries that can learn from available examples and generalize to form appropriate learning rules for inference systems. 4. To provide the mathematical background for SVM, RF and NNbased classification techniques. 5. To understand and demonstrate how to solve patterns learning from a large series of data using computer based learning algorithms	
6	Course Outcomes	On successful completion of this module students will be able to: 1. Identify Machine Learning and stochastic concept. 2. Interpretation of existing models to understand the solution environment. 3. Application of existing mathematical solutions to test problems. 4. Analyse the logical ability to apply feature engineering to extract hierarchical patterns existing in real life problems. 5. Build the understanding of learning theory to glance the upcoming neural robotic world through it. 6. Justify trajectory of recent trend in this subject.	
7	Course Description	**The below practicals will be performed either on Java Based ML library (JAVA-ML) or Python ML library which is scikitlearn**	
8	Outline syllabus		CO Mapping
	Unit 1	**Data Preprocessing**	
	A	Data Cleaning	CO1

	B	Dimensionality reduction approaches			CO1, CO2
	C	Principal Components Analysis, Partial Least Squares			CO1, CO2
	Unit 2	**Regression**			
	A	Linear Regression			CO1, CO2
	B	Multivariate Regression			CO1, CO2
	C	Logistic Regression			CO1, CO2
	Unit 3	**Machine Learning Techniques-PART-I**			
	A	Decision trees and random forest technique			CO1,CO2,CO3
	B	Neural Network Machines			CO1,CO2,CO3
	Unit 4	**Machine learning Techniques- PART -II**			
	A	Support Vector Machines			CO2,CO5,CO6
	B	**Naive Bayes,**			CO3,CO5,CO6
	C	**Bayesian Networks**			CO4,CO5,CO6
	Unit 5	**Model Evaluation**			
	A	Maximum Likelihood Estimate, Bayesian Parameter Estimation			CO3,CO5,CO6
	B	Two Class Evaluation Measures, The ROC Curve			CO4,CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Java-ML source forge.net 2. Scikit-learn.org			
	Other References	1. Baldi, P. and Brunak, S. (2002). Bioinformatics: A Machine Learning Approach. Cambridge, MA: MIT Press. 2. Cohen, P.R. (1995) Empirical Methods in Artificial Intelligence. Cambridge, MA: MIT Press. This is an excellent reference on experiment design, and hypothesis testing, and related topics that are essential for empirical machine learning research.			

Syllabus: CSA201_ Concept of Machine Learning

<table>
<tr><td colspan="2">School: SET</td><td colspan="2">Batch : 2019-2023</td></tr>
<tr><td colspan="2">Program:
B.TECH</td><td colspan="2">Current Academic Year: 2019-20</td></tr>
<tr><td colspan="2">Branch: CSE</td><td colspan="2">Semester: III</td></tr>
<tr><td>1</td><td>Course Code</td><td>CSA201</td><td>Course Name- Concepts of Machine Learning</td></tr>
<tr><td>2</td><td>Course Title</td><td colspan="2">Concepts of Machine Learning</td></tr>
<tr><td>3</td><td>Credits</td><td colspan="2">4</td></tr>
<tr><td>4</td><td>Contact Hours (L-T-P)</td><td colspan="2">3-0-2</td></tr>
<tr><td></td><td>Course Status</td><td colspan="2">Core</td></tr>
<tr><td>5</td><td>Course Objective</td><td colspan="2">Students will try to learn:

1. To introduce the ideas of learning rule and implement them based on human experience.
2. To conceptualize the working of human brain using SVM, RF and ANN.
3. To become familiar with decision boundaries that can learn from available examples and generalize to form appropriate learning rules for inference systems.
4. To provide the mathematical background for SVM, RF and NNbased classification techniques.
5. To understand and demonstrate how to solve patterns learning from a large series of data using computer based learning algorithms</td></tr>
<tr><td>6</td><td>Course Outcomes</td><td colspan="2">On successful completion of this module students will be able to:
1. Identify Machine Learning and stochastic concept.
2. Interpretation of existing models to understand the solution environment.
3. Application of existing mathematical solutions to test problems.</td></tr>
</table>

		4. *Analyse the logical ability to apply feature engineering to extract hierarchical patterns existing in real life problems.* 5. *Build the understanding of learning theory to glance the upcoming neural robotic world through it.* 6. *Justify trajectory of recent trend in this subject.*	
7	Course Description	This course introduces computational learning paradigm for critical & implementable understanding for supervised and unsupervised learning based problem areas.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction and mathematical preliminaries**	
	A	Concept of Machine Learning, Applications of Machine Learning,Machine Learning Pipeline **data, big data, data preprocessing techniques**	CO1
	B	Supervised Learning, UnSupervised Learning, Reinforcement learning	CO1, CO2
	C	Probability Theory, Linear Algebra, Decision Theory	CO1, CO2
	Unit 2	**Data Modeling Techniques**	
	A	Linear Regression, Multivariate Regression	CO1, CO2
	B	Shrinkage Methods, Principal Components Analysis, Partial Least Squares	CO1, CO2
	C	Dimensionality reduction approaches, Classification Linear models, Linear Discriminant Analysis, Logistic Regression	CO1, CO2
	Unit 3	**Machine Learning Techniques**	
	A	Introduction and implementation of Support Vector Machines for large datasets, role of kernels, radial basal kernel	CO1,CO2,CO3
	B	Introduction and implementation of Neural Network Machines for large datasets, neurons, weight initialization	CO1,CO2,CO3
	C	Introduction and implementation of Decision trees and random forest techniques for large datasets.	CO1,CO2,CO3
	Unit 4	**Parameter Estimation, Testing & Evaluation**	
	A	Maximum Likelihood Estimate, Priors & MAP Estimate, Bayesian Parameter Estimation	CO2,CO3,CO4
	B	Bootstrapping & Cross Validation, Two Class Evaluation Measures, The ROC Curve	CO2,CO3,CO4
	C	Hypothesis testing and inferential statistics	CO2,CO3,CO4
	Unit 5	**Graphical Models and ensemble methods**	
	A	**Naive Bayes, Bayesian Networks**	CO2,CO5,CO6
	B	**Undirected Graphical Models - Introduction, Hidden Markov Models, Variable Elimination, Belief Propagation**	CO3,CO5,CO6

	C	**Ensemble theory, ensemble size, Voting and Averaging Based Ensemble Methods, Bagging or Bootstrap Aggregating, Boosting, stacking.**			CO4,CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. **Bishop, C. (2006). Pattern Recognition and Machine Learning**. Berlin: Springer-Verlag. 2. Russel, S. and Norvig, P. (2003). Artifiical Intelligence: A Modern Approach. 2nd Edition. New York: Prentice-Hall.			
	Other References	3. Baldi, P. and Brunak, S. (2002). Bioinformatics: A Machine Learning Approach. Cambridge, MA: MIT Press. 4. Cohen, P.R. (1995) Empirical Methods in Artificial Intelligence. Cambridge, MA: MIT Press. This is an excellent reference on experiment design, and hypothesis testing, and related topics that are essential for empirical machine learning research. 5. https://www.toptal.com/machine-learning/ensemble-methods-machine-learning			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	***CO-1. Identify Machine Learning and stochastic concept.***	PO2, PO5, PO12
2.	***CO-2. Interpretation of existing models to understand the solution environment.***	PO2, PO5, PO6, PO12
3.	***CO-3. Application of existing mathematical solutions to test problems.***	PO2, PO3, PO4, PO5, PO12
4.	CO-4. ***Analyze the logical ability to apply feature engineering to extract hierarchical patterns***	PO2, PO3, PO10, PO12

	existing in real life problems.	
5.	***CO-1. Build the understanding of learning theory to glance the upcoming neural robotic world through it.***	PO2, PO3, PO5, PO9, PO10
6.	CO-2. ***Justify trajectory of recent trend in this subject.***	PO5, PO9, PO10, PO12

PO and PSO mapping with level of strength for Course Name Concept of Machine Learning (Course Code CSA201)

Course Objectives	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	1	2	1	1	3	2	1	2	1	2	1	3
CO2	2	2	2	2	2	2	1	2	2	2	2	3
CO3	2	3	3	3	2	1	1	2	2	3	2	3
CO4	2	3	3	3	3	1	1	2	3	3	2	2
CO5	2	3	3	2	3	1	1	2	3	3	2	2
CO6	1	2	2	2	3	1	1	2	3	2	2	3

School: SET		**Batch : 2019-2023**	
Program:B.Tech.		**Current Academic Year: 2019-20**	
Branch:CSE		**Semester:IV**	
1	Course Code	CSA202	Course Name
2	Course Title	**SOFT COMPUTING**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	**Students will try to learn:** 1. To provide the mathematical background for carrying out the optimization 2. To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience. 3. To conceptualize the working of human brain using ANN. 4. To become familiar with neural networks that can learn from	

		available examples and generalize to form appropriate rules for inference systems. 5. To provide the mathematical background for carrying out the optimization and familiarizing genetic algorithm for seeking global optimum in self-learning situation.	
6	Course Outcomes	After Successful completion of this course the student will be able to: 1. ***Identify*** basic mathematical/statistical methods used in soft computing. 2. ***Formulate*** fuzzy logic inference with emphasis on their use in the design of intelligent or humanistic systems. 3. ***Solve*** problems involving ambiguities, uncertainties, vagueness and inexactness 4. ***Analyze*** learning techniques used in different cases. 5. ***Integrate***optimization techniques in problems of Engineering and Technology using genetic algorithm. 6. ***Justify*** use of soft computing terminologies in Decision and control system.	
7	Course Description	This course introduces soft computing theories, techniques and tools. Those are frequently required for understanding and developing the exploratory data analysis techniques, and knowledge discovery and intelligent systems.	
8	Outline syllabus		CO Mapping
	Unit 1	**PROBABILITY AND STATISTICS**	
	A	Introduction to probability and statistics	CO1, CO2
	B	Regression analysis	CO1, CO2
	C	Distance & Similarity measures and Clustering and Decision functions.	CO1, CO2
	Unit 2	**FUZZY THEORY**	
	A	Basic concepts of fuzzy logic, Fuzzy sets and crisp relations	CO1, CO2
	B	Membership functions , interference in fuzzy logic, Fuzzification and defuzzification	CO1, CO2
	C	Introduction to fuzzy logic(**Matlab Fuzzy logic toolbox**)	CO1, CO2, CO6
	Unit 3	**INTRODUCTION TO NEURAL NETWORKS**	
	A	Basic concepts, Neural network architecture: single layer and multilayer feed forward networks	CO1, CO3
	B	Supervised and Unsupervised learning, Activation functions(**Matlab Neural network tool box**)	CO1, CO3, CO4

	C	Perceptron model, Back propagation networks - Kohonen's self organizing map.			CO1, CO3, CO4, CO6
	Unit 4	**INTRODUCTION TO GENETIC ALGORITHM AND GENETIC PROGRAMMING**			
	A	Basic concepts and operations			CO1,CO5
	B	classification of genetic algorithms,			CO1,CO5
	C	Applications of genetic algorithms.(**Matlab Genetic algorithm tool box)**			CO1,CO5, CO6
	Unit 5	**APPLICATIONS OF SOFT COMPUTING**			
	A	Elementary applications in image processing,			CO1,CO2,CO3, CO4,CO5, CO6
	B	Pattern recognition			CO1,CO2,CO3, CO4,CO5, CO6
	C	Designing control systems			CO1,CO2,CO3, CO4,CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. RAJASEKARAN, S., PAI, G. A. VIJAYALAKSHMI "NEURAL NETWORKS, FUZZY SYSTEMS AND EVOLUTIONARY ALGORITHMS : SYNTHESIS AND APPLICATIONS", PHI Learning 2. Jang J.S.R., Sun C.T. and Mizutani E, "Neuro-Fuzzy and Soft computing", Prentice Hall. 3. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw Hill,			
	Other References	1. LaureneFausett, "Fundamentals of Neural Networks", Prentice Hall, 2. George J. Klir and Bo Yuan, "Fuzzy sets and Fuzzy Logic", Prentice Hall,USA.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-1. ***Identify*** basic mathematical/statistical methods used in soft computing.	PO1, PO2, PO6, PO8 PO12
2.	CO-2. ***Formulate*** fuzzy logic inference with emphasis on their use in the design of intelligent or humanistic systems.	PO1, PO2, PO3, PO6, PO8
3.	CO-3. ***Solve*** problems involving ambiguities,	PO2, PO3, PO6, PO9

	uncertainties, vagueness and inexactness	
4.	CO-1. ***Analyze*** learning techniques used in different cases.	PO3, PO4, PO9, PO10 PO12
5.	CO-2. ***Integrate***optimization techniques in problems of Engineering and Technology using genetic algorithm.	PO3, PO4, PO5, PO9, PO10
6.	CO-3. ***Justify*** use of soft computing terminologies in Decision and control system.	PO3, PO4, PO5, PO9, PO10, PO12

PO and PSO mapping with level of strength for SOFT COMPUTING (Course Code CSA202)

Course Objectives	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	1	2	1	2	2	1	1	3
CO2	3	3	3	2	2	2	1	2	2	2	1	3
CO3	2	3	3	2	2	2	1	2	3	2	1	2
CO4	2	2	3	3	3	1	1	2	3	3	1	3
CO5	2	2	3	3	3	1	1	2	3	3	1	2
CO6	1	2	3	3	3	2	1	2	3	3	1	3

PBL-1 (Soft-Computing Lab)
Tool: Matlab
List of Experiments
UNIT 1

1. Installation of Matlab and understanding basic operation of MatLab
   Creating Variables and work on assignment Statements, Creating Matrix, vectors and performing functions on them.
   Creating functions, if, if-else, switch statements. Loopiing, file handling, Statistical functions.

UNIT2

2. Working with Matlab Fuzzy logic toolbox
   Creating fuzzy sets, membership functions, Logical operations on sets
   Developing if-then rules. developing fuzzy-inference system.

UNIT3

3. Working with Matlab Neural network tool box
   Implementation of single layer and multilayer feed forward networks.
   Classification of linearly separable data with a perceptron.
   Solving XOR problem with a multilayer perceptron

UNIT4

4. Working with Matlab Genetic algorithm tool box

UNIT5

5. Developing a mini-project based on any application area of Soft-computing in Matlab

School: SET		**Batch : 2019-2023**		
Program: B.Tech		**Current Academic Year: 2019-20**		
Branch: ALL		**Semester: V**		
1	Course Code	**CSA301**	Course Name: Computer Vision	
2	Course Title	Computer Vision		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	CORE		
5	Course Objective	19. To implement fundamental image processing techniques required for computer vision 20. To develop applications using computer vision techniques		
6	Course Outcomes	Students will be able to: CO1: Understanding computer vision and image filtering CO2: Understanding the image formation models. CO3: Preprocessing the image, and then doing segmentation and edge detection. CO4: Extract features form Images and do analysis of Image CO5: Analyzing the pattern and performing classification.		
7	Course Description	In this course students will learn basic principles of image formation, image processing algorithms, extracting the features and then analyzing the underlying patterns.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction to Computer Vision**		
	A	Computer Vision and Computer Graphics , What is Computer Vision - Low-level, Mid-level, High-level		CO1,
	B	Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis		CO1
	C	Image Filtering (spatial domain) • Mask-based (e.g., correlation, convolution) • Smoothing (e.g., Gaussian), Sharpening (e.g., gradient)		CO1
	Unit 2	**Image Formation Models**		
	A	Monocular imaging system , Radiosity: The		CO2

		'Physics' of Image Formation, Radiance, Irradiance, Brightness, color etc,			
	B	Orthographic & Perspective Projection ,Camera model and Camera calibration, Binocular imaging systems			CO2
	C	Multiple views geometry, Structure determination, shape from shading			CO2
	Unit 3	**Image Processing**			
	A	Image preprocessing: Orthogonal, Euclidean, Affine, Projective, etc; Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.			CO3
	B	Segmentation : • Edge-based (e.g., voting, optimization, perceptual grouping) • Pixel-based (e.g., clustering)			CO3
	C	Edge detection: Canny, Laplacian of Gaussian			CO3
	Unit 4	**Feature Extraction**			
	A	Edges - Canny, LOG, DOG; Line detectors (Hough Transform)			CO4
	B	Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH			CO4
	C	Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.			CO4
	Unit 5	**Pattern Analysis**			
	A	Clustering: K-Means, K-Medoids, Mixture of Gaussians			CO5
	B	Classification: Discriminant Function, Supervised, Un-supervised, Semi-supervised			CO5
	C	Classifiers: Bayes, KNN, ANN models			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1.Digital Image Processing and Computer Vision – Milan Sonka 2.Computer Vision - A modern approach, by D. Forsyth and J. Ponce, Prentice Hall Robot Vision, by B. K. P. Horn, McGraw-Hill.			
	Other References	1, Introductory Techniques for 3D Computer Vision, by E. Trucco and A. Verri, Publisher: Prentice Hall. 2. R. C. Gonzalez, R. E. Woods. Digital Image Processing. Addison Wesley			

		Longman, Inc., 1992. 3. D. H. Ballard, C. M. Brown. Computer Vision. Prentice-Hall, Englewood Cliffs, 1982.	

School: SET		**Batch : 2019-2023**	
Program: B.TECH		**Current Academic Year: 2019-20**	
Branch: CSE		**Semester: VI**	
1	Course Code	CSA302	Course Name- Introduction to Deep Leaning
2	Course Title	**Introduction to Deep Leaning**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-0-2	
	Course Status	CORE	
5	Course Objective	**Students will try to learn:** 6. To introduce the ideas of learning rule and implement them based on human experience. 7. To conceptualize the working of human brain using ANN. 8. To become familiar with neural networks that can learn from available examples and generalize to form appropriate learning rules for inference systems. 9. To provide the mathematical background for Neural Network and classification techniques. 10. To understand and demonstrate how to solve general learning from a large series of data using computer based deep learning algorithms	
6	Course Outcomes	On successful completion of this module students will be able to: ***1. Recognize Machine Learning and henceforth Deep Learning concept.*** ***2. Interpretation of existing models to understand the solution environment.*** ***3. Application of existing mathematical solutions to test problems.***	

		4. Analyze the logical ability to automatically extract hierarchical patterns existing in real life problems. ***5. Build the understanding of learning theory to glance the upcoming neural robotic world through it.*** 6. ***Justify trajectory of recent trend in this subject.***			
7	Course Description	This course introduces neural computational paradigm for critical & implementable understanding for automated learning based problem areas.			
8	Outline syllabus				CO Mapping
	Unit 1	**Introduction to deep learning**			
	A	Introduction to deep learning, Neural Network Basics			CO1
	B	Shallow Neural Network, Deep Neural Networks			CO1, CO2
	C	Practical aspects of deep learning, Optimization algorithms			CO1, CO2
	Unit 2	**Parameters and Hyperparameters**			
	A	Hyperparameter Tuning, Batch Normalization			CO1, CO2
	B	ML Strategy, case studies like Autonomous driving.			CO1, CO2
	C	Recent developments in deep neural networks			CO1, CO2
	Unit 3	**Trade-off and regularization**			
	A	Overview of ways to improve generalization, Limiting the size of the weights, Regularizations and its role in learning, Using noise as a regularizer			CO1,CO2,CO3
	B	Overfitting and Underfitting, Bias- Variance tradeoff, pruning algorithms			CO1,CO2,CO3
	C	The ups and downs of back propagation, Dropout, Introduction to the full Bayesian approach			CO1,CO2,CO3
	Unit 4	**Convolutional Neural Networks**			
	A	Why CNN??, its role, significance			CO2,CO3,CO4
	B	Various layers of CNN, max pooling, convolutional layers			CO2,CO3,CO4
	C	Standard CNN models: VGGnet, Googlenet			CO2,CO3,CO4
	Unit 5	**Recurrent Neural Networks**			
	A	Role of Recurrent Neural Network, Significance in real world			CO2,CO5,CO6
	B	RNN model, its disadvantages and introduction of Long Short Term Memory Neural Networks, Learning Algorithm of LSTM/ RNN.			CO3,CO5,CO6
	C	Case Study of a real life example deploying above techniques			CO4,CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	

	Text book/s*	1. **Deep Learning, by Yann L., Yoshua B. & Geoffrey H. (2015)** 2. **Visualizing and Understanding Convolutional Networks, by Matt Zeiler, Rob Fergus** 3. **TensorFlow: a system for large-scale machine learning, by Martín A., Paul B., Jianmin C., Zhifeng C., Andy D. et al. (2019)**
	Other References	1. **Deep learning in neural networks, by Juergen Schmidhuber (2015)** 2. https://cs230.stanford.edu/syllabus/ 3. https://towardsdatascience.com/september-edition-machine-learning-case-studies-a3a61dc94f23 4. **Deep Learning: A Practitioner's Approach by Josh Patterson, Oreilly.**

School: SET		**Batch : 2019-2023**	
Program: B.TECH		**Current Academic Year: 2019-20**	
Branch: CSE		**Semester:**	
1	Course Code	CSA303	Course Name- Pattern Recognition
2	Course Title	**Pattern Recognition**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	CORE	
5	Course Objective	**Students will try to learn:** 1. To introduce the ideas of existing patterns and implement them based on data analysis. 2. To conceptualize the working of patterns explorations using computational algorithms. 3. To become familiar with feature knowledge that can be extracted from available examples and generalize to form appropriate feature models. 4. To provide the mathematical background for feature engineering and classification techniques. 5. To understand and demonstrate how to solve logical and scientific problems using the basic understanding of hidden patterns with a series of data or in a data bank	
6	Course	On successful completion of this module students will be able to:	

	Outcomes	***CO 1. Identify Pattern concept and random process ideas, understand mathematical background .*** ***CO 2. Interpretation of existing models to understand the solution environment.*** ***CO 3. Application of existing mathematical solutions to test problems.*** ***CO 4. Analyze the logical ability to apply pattern search in real life examples.*** ***CO 5. Build the understanding of probability theory to glance the world through it.*** CO 6. ***Justify trajectory of recent trend in this subject.***	
7	Course Description	This course introduces neural computational paradigm for critical & implementable understanding of feature engineering.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction and mathematical preliminaries**	
	A	What is Pattern recognition; Applications and Examples	CO1
	B	Clustering vs. Classification; Supervised vs. unsupervised, Relevant basics of Linear Algebra	CO1, CO2
	C	Vector spaces, Probability Theory, Estimation Theory	CO1, CO2
	Unit 2	**Bayes Decision Theory**	
	A	Discriminant Functions and Services	CO1, CO2
	B	Normal Distribution, Bayesian Classification, Estimating Probability Density Functions,	CO1, CO2
	C	Nearest Neighbor Rules, Bayesian Network	CO1, CO2
	Unit 3	**Clustering**	
	A	Basics of Clustering; similarity / dissimilarity measures; clustering criteria. Different distance functions and similarity measures, ,	CO1,CO2,CO3
	B	Minimum within cluster distance criterion, K-means algorithm,	CO1,CO2,CO3
	C	K-medoids, DBSCAN	CO1,CO2,CO3
	Unit 4	**Feature selection**	
	A	High Arity problem statement and possible solutions	CO2,CO3,CO4
	B	Algorithms - Branch and bound algorithm, sequential forward / backward selection algorithms	CO2,CO3,CO4
	C	Probabilistic separability based criterion functions, interclass distance based criterion functions	CO2,CO3,CO4
	Unit 5	**Feature Extraction & Recent Advances in Patterns Recognitions**	
	A	PCA , Kernel PCA, Singular Value Decomposition, Wavelets and Fractals,	CO2,CO5,CO6
	B	Support Vector Machine, Neural Networks	CO3,CO5,CO6

	C	Case Study of a real life example deploying above techniques			CO4,CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	5. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, John Wiley, 2001. 6. Statistical pattern Recognition; K. Fukunaga; Academic Press, 2000.			
	Other References	3. S.Theodoridis and K.Koutroumbas, Pattern Recognition, 4th Ed., Academic Press, 2009. 4. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006. 5. A Course in Probability Theory by Kai Lai Chung, Elsevier			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	***CO-5. Identify Pattern concept and random process ideas.***	PO2, PO5, PO12
2.	***CO-6. Interpretation of existing models to understand the solution environment.***	PO2, PO5, PO6, PO12
3.	CO-7. ***Application of existing mathematical solutions to test problems.***	PO2, PO3, PO4, PO5, PO12
4.	CO-8. ***Analyze the logical ability to apply pattern search in real life examples.***	PO2, PO3, PO10, PO12
5.	***CO-1. Build the understanding of probability theory to glance the world through it.***	PO2, PO3, PO5, PO9, PO10

6.	CO-2. ***Justify trajectory of recent trend in this subject.***	PO5, PO9, PO10, PO12

PO and PSO mapping with level of strength for Course Name Pattern Recognition

Course Objectives	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	1	2	1	1	3	2	1	2	1	2	1	3
CO2	2	2	2	2	2	2	1	2	2	2	2	3
CO3	2	3	3	3	2	1	1	2	2	3	2	3
CO4	2	3	3	3	3	1	1	2	3	3	2	2
CO5	2	3	3	2	3	1	1	2	3	3	2	2
CO6	1	2	2	2	3	1	1	2	3	2	2	3

School: SET		**Batch : 2019-2023**	
Program: B-TECH		**Current Academic Year: 2019-20**	
Branch: CSE		**Semester: VII**	
1	Course Code	**CSA401**	Course Name: Robotics and Intelligent Systems
2	Course Title	Robotics and Intelligent Systems	
3	Credits	3	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Elective	
5	Course Objective	**Students will try to learn:** 21. Fundamental principles of robot system design and operation. 22. How to apply concepts of translational and rotational motion, and gears to robot construction.	

		23. To design and program simple autonomous robots. 24. To implement algorithms that enables the use of sensors and actuators to facilitate intelligent behavior, learning and perception.	
6	Course Outcomes	Students will be able to: CO-1. ***Recognize*** concept development and key components of robotics technologies. CO-2. ***Classify*** various robot sensors and their perception principles that enable a robot to analyze their environment, reason and take appropriate actions toward the given goal. CO-3. ***Apply*** the learned knowledge and skills in practical robotics laboratories and experiments. CO-4. ***Analyze*** problems in spatial coordinate representation and spatial transformation, robot locomotion design, kinematics, motion control, localization and mapping, navigation and path planning. CO-5. ***Design*** a robotic project on a physical mobile robot platform, with tasks involving project specification, algorithm design, programming, simulation, control and obstacle avoidance in a complex and interactive environment. ***CO-6. Appraise*** intelligent system methodology suitable for a given type of application problem.	
7	Course Description	Basic concepts of Robotics, Intelligent Systems and transformational modeling.	
8	Outline syllabus		CO Mapping
	Unit 1	**Overview and Preliminaries**	
	A	Mobile Robots, Position, and Orientation	CO1
	B	Translational and Rotational Dynamics	CO1, CO2
	C	Flying and Swimming Robots, Articulated Robots	CO1, CO2
	Unit 2	**Transformation**,	
	A	Path Planning, and Trajectories	CO1, CO2
	B	Time Response of Dynamic Systems	CO1, CO2
	C	Dynamic Effects of Feedback Control, Control Systems	CO1, CO2
	Unit 3	**Optimization**	
	A	Sensors and Actuators	CO1, CO2, CO4
	B	Numerical Optimization	CO1, CO2, CO4
	C	Dynamic Optimal Control	CO1, CO2,

					CO4
	Unit 4	**Formal Logic, Algorithms, and Incompleteness**			
	A	Computers, Computing, and Sets			CO3, CO5
	B	Probability and Statistics			CO3, CO5
	C	Machine Learning, Neural Networks			CO3, CO5
	Unit 5	**Information, Search and Expert Systems**			
	A	State Estimation, Stochastic Control			CO3, CO5, CO6
	B	Parameter Estimation and Adaptive Control			CO3, CO5, CO6
	C	Task Planning and Multi-Agent Systems			CO3, CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. http://www.princeton.edu/~stengel/RISVirText.html. 2. J. J. Craig, Introduction to Robotics, Addison Wesley Publishers, 2005, 3. *Computational Principles of Mobile Robotics* by Gregory Dudek and Michael Jenkin, Second Edition			
	Other References	1. M. Negnevitsky, Artificial Intelligence – A guide to intelligent systems Addison-Wesley, 2005, 2. Bharati A., Sangal R., Chaitanya V.. *Natural language processing: a Paninian perspective*, PHI, 2000			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-1. ***Recognize*** concept development and key components of robotics technologies.	PO1, PO2, PO10,PO12
2.	CO-2. ***Classify*** various robot sensors and their perception principles that enable a robot to analyze their environment, reason and take appropriate actions toward the given goal.	PO1, PO2, PO3, PO4, PO7 PO10,PO12
3.	CO-3. ***Apply*** the learned knowledge and skills	PO1, PO2, PO3, PO4, PO5, PO6,

	in practical robotics laboratories and experiments.	PO10,PO12
4.	CO-4. ***Analyze*** problems in spatial coordinate representation and spatial transformation, robot locomotion design,kinematics, motion control, localization and mapping, navigation and path planning.	PO1, PO2, PO3, PO4, PO5, PO9, PO10,PO12
5.	CO-5. ***Design*** a robotic project on a physical mobile robot platform, with tasks involving project specification, algorithm design, programming, simulation, control and obstacle avoidance in a complex and interactive environment.	PO2, PO3, PO4, PO5, PO9, PO10, PO12
6.	CO-6. ***Appraise*** intelligent system methodology suitable for a given type of application problem.	PO2, PO3, PO4, PO5, PO6, PO9, PO10, PO11, PO12

PO and PSO mapping with level of strength for Course Name Robotics and Intelligent Systems **(Course Code CSA401)**

Course Objectives	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	2	2	2	1	1					2		2
CO2	3	3	2	2	1		2			2		2
CO3	3	3	3	3	2	2	1			2	2	3
CO4	2	3	2	3	3	1			2	2	1	2
CO5	1	2	3	2	3	1			2	2		2
CO6	1	3	3	3	3	2		2	3	3	2	2

School: SET		**Batch : 2019-2023**	
Program:B.Tech.		**Current Academic Year: 2019-20**	
Branch:CSE		**Semester:**	
1	Course Code	CSA021	Course Name- **Human Computer Interaction**
2	Course Title	**Human Computer Interaction**	

3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	ELECTIVE	
5	Course Objective	• Learn the foundations of Human Computer Interaction • Be familiar with the design technologies for individuals and persons with disabilities • Be aware of mobile HCI • Learn the guidelines for user interface	
6	Course Outcomes	Upon completion of the course, the student should be able to: • Design effective dialog for HCI. • Design effective HCI for individuals and persons with disabilities. • Assess the importance of user feedback. • Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites. • Develop meaningful user interface.	
7	Course Description		
8			CO Mapping
	Unit 1	**Introduction**	
	A	The Human: I/O channels – Memory – Reasoning and problem solving;	CO1, CO2
	B	The computer: Devices – Memory – processing and networks	CO1, CO2
	C	Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.	CO1, CO2
	Unit 2	**Design process**	
	A	Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping.	CO1, CO2
	B	HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale.	CO1, CO2
	C	Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.	CO1, CO2, CO6
	Unit 3	**Models**	
	A	Cognitive models –Socio-Organizational issues and	CO1, CO3

		stake holder requirements			
	B	Communication and collaboration models			CO1, CO3, CO4
	C	Hypertext, Multimedia and WWW.			CO1, CO3, CO4, CO6
	Unit 4	**MOBILE HCI**			
	A	Mobile Ecosystem: Platforms, Application frameworks, Types of Mobile Applications: Widgets, Applications			CO1,CO5
	B	Games- Mobile Information Architecture			CO1,CO5
	C	Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools			CO1,CO5, CO6
	Unit 5	**WEB INTERFACE DESIGN**			
	A	Designing Web Interfaces – Drag & Drop,			CO1,CO2,CO3, CO4,CO5, CO6
	B	Direct Selection, Contextual Tools,			CO1,CO2,CO3, CO4,CO5, CO6
	C	Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.			CO1,CO2,CO3, CO4,CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	• Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, "Human Computer Interaction", 3rd Edition, Pearson Education, 2004 (UNIT I , II & III) • Brian Fling, "Mobile Design and Development", First Edition , O‟Reilly Media Inc., 2009 (UNIT –IV) • Bill Scott and Theresa Neil, "Designing Web Interfaces", First Edition, O‟Reilly, 2009.(UNIT-V)			
	Other References				

School: SET		**Batch : 2019-2023**		
Program:B.Tech.		**Current Academic Year: 2019-20**		
Branch:CSE		**Semester:**		
1	Course Code	CSA022	Course Name- **ML for Healthcare**	
2	Course Title	**ML for Healthcare**		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	Core		
5	Course Objective	1) To INTRODUCE 2) To introduce the.		
6	Course Outcomes	After Successful completion of this course the student will be able to: 1) ***Identify*** 2) ***Formulate*** ***3) Solve*** 4) ***Analyze*** 5) ***Integrate*** 6) ***Justify***		
7	Course Description	Introduces students to machine learning in healthcare, including the nature of clinical data and the use of machine learning for risk stratification, disease progression modeling, precision medicine, diagnosis, subtype discovery, and improving clinical workflows.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction**		
	A	Brief history of AI and ML in healthcare (Examples of existing/earlier developed healthcare systems like-MYCIN)		CO1, CO2
	B	Data:-Electronic health records (EHR), Types of health care Data, diversity of digital health data, data standardization, data in emergency department (ED).		CO1, CO2
	C	Advances in ML, Industry interest in healthcare, opportunities for ML.		CO1, CO2
	Unit 2	**Risk stratification**		
	A	Risk stratification, deriving labels, chart -review, Visualization of individual patient data		CO1, CO2
	B	Evaluation - ROC curve, AUC curve, non-stationarity of data		CO1, CO2
	C	ML based risk stratification, survival modelling		CO1, CO2,

			CO6
	Unit 3	Clinical Text	
	A	Value of the data in clinical text, Challenges in Clinical Natural Language	CO1, CO3
	B	Term spotting and handling negation, uncertainty Building Models	CO1, CO3, CO4
	C	Unified Medical Language Systems, Lexical Variant Generation (LVG) Tools	CO1, CO3, CO4, CO6
	Unit 4	**AI impacts**	
	A	AI impacts across the entire healthcare industry	CO1,CO5
	B	Time series analysis with medical applications	CO1,CO5
	C	Will AI replace Doctors?	CO1,CO5, CO6
	Unit 5	**AI/ML use cases in health care**	
	A	Patient care: Assisted or automated diagnosis & prescription, Real-time prioritization and triage, Personalized medications and care	CO1,CO2,CO3, CO4,CO5, CO6
	B	Medical Imaging and Diagnostic: Early diagnosis, Medical imaging insight	CO1,CO2,CO3, CO4,CO5, CO6
	C	Research and development, Healthcare management	CO1,CO2,CO3, CO4,CO5, CO6
	Mode of examination	Theory	
	Weightage Distribution	CA / 30%	MTE / 20%	ETE / 50%
	Text book/s*	https://mlhc19mit.github.io	
	Other References	https://blog.appliedai.com/healthcare-ai/	

School: SET		**Batch : 2019-2023**		
Program: B-TECH		**Current Academic Year: 2019-20**		
Branch: CSE		**Semester:**		
1	Course Code	**CSA031**	Course Name: Digital Image Processing	
2	Course Title	Digital Image Processing		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	UG		
5	Course Objective	**Students will try to learn:** 25. To study the image fundamentals and mathematical transforms necessary for image processing. 26. To study the image enhancement techniques 27. To study image restoration procedures. 28. To study the image compression procedures		
6	Course Outcomes	Students will be able to: CO-13. ***Recognize*** the fundamental concepts of a digital image processing system. CO-14. ***Formulate*** images in the frequency domain using various transformations. CO-15. ***Perform*** operations for image enhancement and image restoration. CO-16. ***Interpret*** image segmentation and representation techniques. CO-17. ***Design*** Image application for recognitions. CO-18. ***Support*** Computer Vision techniques in intelligent systems.		
7	Course Description	Basic concepts of Digital Image Processing		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction**		
	A	**Fundamental of digital image processing:**		CO1,
	B	**Image Enhancement** in Spatial Domain		CO1
	C	Arithmetic/Logic Operations in Image enhancement		CO1
	Unit 2	**Image Enhancement in Frequency Domain**		
	A	Fourier Transform Filters –		CO2
	B	Low-pass filter in frequency domain		CO2
	C	High-pass filter in frequency domain		CO2
	Unit 3	**Image Restoration & segmentation**		
	A	Restoration Process model.		CO3

	B	Segmentation and Region Extraction,			CO3
	C	Edge Detection and Corner Detection.			CO3
	Unit 4	**Color Image Processing**			
	A	Color Models, Color Transformation			CO4
	B	Morphological Image Processing			CO4
	C	Morphological Operations			CO4
	Unit 5	**Application of Digital Image Processing**			
	A	Face Recognition			CO5 ,CO6
	B	Optical character recognition			CO5,CO6
	C	Computer vision			CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Digital Image Processing 2nd Edition, Rafael C. Gonzalvez and Richard E. Woods. Published by: Pearson Education.			
	Other References	3. Digital Image Processing and Computer Vision, R.J. Schalkoff. Published by: John Wiley and Sons, NY. 4. Fundamentals of Digital Image Processing, A.K. Jain. Published by Prentice Hall, Upper Saddle River, NJ.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-1. ***Recognize*** the fundamental concepts of a digital image processing system.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
2.	CO-2. ***Formulate*** images in the frequency domain using various transformations.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
3.	CO-3. ***Perform*** operations for image enhancement and image restoration.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
4.	CO-4. ***Interpret*** image segmentation and representation techniques.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
5.	CO-5. ***Design*** Image application for recognitions.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5
6.	CO-6. ***Support*** Computer Vision techniques in intelligent systems.	PO1,PO2,PO3,PO11,PO12 PSO1,PSO2,PSO3,PSO4,SPO5

PO and PSO mapping with level of strength for Course Name Digital Image Processing **(Course Code CSA031)**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	2	3	-	-	-	-	-	-	-	2	1	3	2	2	1	2
CO2	3	2	3	-	-	-	-	-	-	-	2	1	3	2	2	1	2
CO3	3	2	3	-	-	-	-	-	-	-	1	1	2	3	2	1	2
CO4	3	2	3	-	-	-	-	-	-	-	3	2	3	2	1	1	1
CO5	3	2	3	-	-	-	-	-	-	-	3	1	2	2	2	1	3
CO6	3	2	3	-	-	-	-	-	-	-	3	1	2	2	2	1	3

School: SET		**Batch : 2019-2023**	
Program: B-TECH		**Current Academic Year: 2019-20**	
Branch: CSE		**Semester:**	
1	Course Code	**CSA032**	Course Name: Natural Language Processing
2	Course Title	Natural Language Processing	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	**Students will try to learn:** 29. Basics of natural language processing. 30. How to apply basic algorithms in natural language processing. 31. Algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics. 32. Basics of knowledge representation, inference, and relations to the artificial intelligence. 33. Techniques such as tokenization, stemming, and lemmatization.	
6	Course Outcomes	Students will be able to: CO-19. ***Identify*** Linguistic phenomena and an ability to model them with formal grammars**.** CO-20. ***Illustrate*** proper experimental methodology for training and evaluating empirical NLP systems. CO-21. ***Use*** probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods. CO-22. ***Compare*** algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics. CO-23. ***Integrate*** knowledge representation, inference, and relations to the artificial intelligence. CO-24. ***Support*** Machine Translation techniques in intelligent systems.	
7	Course Description	Basic concepts of Language and Grammar.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Human languages, processing paradigms;	CO1

	B	Characteristics of Natural Languages; Components of languages			CO1, CO2
	C	Regular expressions, Language Modeling			CO1, CO2
	Unit 2	**Morphological Analysis;**			
	A	POS Tagging; Syntactic Analysis;			CO1, CO2
	B	Parsing, Grammars for Parsing,			CO1, CO2
	C	N-grams			CO1, CO2
	Unit 3	**Semantic Analysis;**			
	A	Ambiguities and Disambiguation;			CO1, CO2, CO4
	B	Word Sense Disambiguation			CO1, CO2, CO4
	C	Phrase and Sentence level disambiguation;			CO1, CO2, CO4
	Unit 4	**Machine Translation**			
	A	Transformation Approaches and Statistical approaches;			CO3, CO5
	B	Analysis of some Translation Systems			CO3, CO5
	C	English to Indian Languages and Indian Languages to English Translation Systems;			CO3, CO5
	Unit 5	**Applications and further studies**			
	A	Translation among Indian Languages.			CO3, CO5, CO6
	B	**Information Extraction**			CO3, CO5, CO6
	C	Text Summarization and Classification			CO3, CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	4. Daniel Jurafsky and James H Martin. *Speech and Language Processing, 2e*, Pearson Education, 2009. 5. Siddiqui T., Tiwary U. S.. *Natural language processing and Information retrieval*, OUP, 2008			
	Other References	3. James A.. *Natural language Understanding 2e*, Pearson Education, 1994 4. Bharati A., Sangal R., Chaitanya V.. *Natural language processing: a Paninian perspective*, PHI, 2000			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-1. ***Identify*** Linguistic phenomena and an ability to model them with formal grammars**.**	PO1, PO2, PO10,PO12
2.	CO-2. ***Illustrate*** proper experimental methodology for training and evaluating empirical NLP systems.	PO1, PO2, PO3, PO4, PO7 PO10,PO12
3.	CO-3. ***Use*** probabilities, construct statistical models over strings and trees, and estimate parameters using supervised and unsupervised training methods.	PO1, PO2, PO3, PO4, PO5, PO6, PO10,PO12
4.	CO-4. ***Compare*** algorithmic description of the main language levels: morphology, syntax, semantics, and pragmatics.	PO1, PO2, PO3, PO4, PO5, PO9, PO10,PO12
5.	CO-5. ***Integrate*** knowledge representation, inference, and relations to the artificial intelligence.	PO2, PO3, PO4, PO5, PO9, PO10, PO12
6.	CO-6. ***Support*** Machine Translation techniques in intelligent systems.	PO2, PO3, PO4, PO5, PO6, PO9, PO10, PO11, PO12

PO and PSO mapping with level of strength for Course Name Natural Language Processing **(Course Code CSA032)**

Course Objectives	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
NLP-CO1	2	2	2	1	1					2		2
NLP-CO2	3	3	2	2	1		2			2		2
NLP-CO3	3	3	3	3	2	2	1			2	2	3
NLP-CO4	2	3	2	3	3	1			2	2	1	2
NLP-CO5	1	2	3	2	3	1			2	2		2
NLP-CO6	1	3	3	3	3	2		2	3	3	2	2

School: SET		**Batch : 2019-2023**	
Program: B.TECH		**Current Academic Year: 2019-20**	
Branch:CSE		**Semester:**	
1	Course Code	CSA042	Course Name- **Neural Networks**
2	Course Title	**Neural Networks**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	PROGRAM ELECTIVE- 3	
5	Course Objective	**Students will try to learn:** 1. To introduce the ideas of learning rule and implement them based on human experience. 2. To conceptualize the working of human brain using ANN. 3. To become familiar with neural networks that can learn from available examples and generalize to form appropriate learning rules for inference systems. 4. To provide the mathematical background for Neural Network and classification techniques. 5. To provide the mathematical background for carrying out the optimization and familiarizing genetic algorithm for seeking global optimum in self-learning situation.	
6	Course Outcomes	On successful completion of this module students will be able to: 1. ***Define*** biological significance of Neural Network. 2. ***Classify*** supervised and unsupervised learning. 3. ***Demonstrate*** single and multi-layer feed-forward neural networks. 4. ***Analyze*** and train radial-basis function networks; 5. ***Build*** program for linear and nonlinear models for applications; 6. ***Evaluate*** the performance of neural networks.	
7	Course Description	This course introduces neural computational paradigm for critical & implementable understanding for pattern based problem areas.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Biological Significance	CO1
	B	Neuron & its functionalities	CO1, CO2
	C	Components of Artificial Neural Network	CO1, CO2
	Unit 2	**Learning**	

	A	Learning Rule & Learning Paradigms			CO1, CO2
	B	Training & Testing in learning			CO1, CO2
	C	Analysis: Learning Curve & Error Measurement			CO1, CO2
	Unit 3	**Perceptron**			
	A	Perceptron, Layers, Convergence Theorem			CO1,CO2,CO3
	B	Activation Function, Weight Initialization			CO1,CO2,CO3
	C	Back-propagation, Delta Learning Rule			CO1,CO2,CO3
	Unit 4	**Radial Basis Networks**			
	A	Components & Structure			CO2,CO3,CO4
	B	Training & Testing			CO2,CO3,CO4
	C	Enhancements in Radial Basis Networks			CO2,CO3,CO4
	Unit 5	**Applications & Case Studies**			
	A	Cluster analysis, neural networks used for prediction			CO2,CO5,CO6
	B	Probabilistic Neural Networks (PNN) development & verifications using image dataset for pattern detection			CO3,CO5,CO6
	C	Radial Basis Function Neural Networks (RBFNN) development using medical imagining dataset for pattern detection			CO4,CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	3. David Kriesel, 2007, "*A Brief Introduction to Neural Networks*", available at http://www.dkriesel.com 4. Simon O. Haykin, **"Neural Networks and Learning Machines",** *Pearson*			
	Other References	6. ANDERSON, JAMES A., AN INTRODUCTION TO NEURAL NETWORKS, PHI Learning. 7. Christopher M. Bishop & Geoffrey Hinton, Neural Networks for Pattern Recognition, Oxford University Press.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-9. ***Define*** biological significance of Neural Network.	PO2, PO5, PO12
2.	CO-10. ***Classify*** supervised and unsupervised learning.	PO2, PO5, PO6, PO12

3.	CO-11. ***Demonstrate*** single and multi-layer feed-forward neural networks.	PO2, PO3, PO4, PO5, PO12
4.	CO-12. ***Analyze*** and train radial-basis function networks;	PO2, PO3, PO10, PO12
5.	CO-13. ***Build*** program for linear and nonlinear models for applications;	PO2, PO3, PO5, PO9, PO10
6.	CO-14. ***Evaluate*** the performance of neural networks.	PO5, PO9, PO10, PO12

PO and PSO mapping with level of strength for Course Name Neural Networks (Course Code CSA042)

Course Objectives	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CSE435-CO1	1	2	1	1	3	2	1	2	1	2	1	3
CSE435-CO2	2	2	2	2	2	2	1	2	2	2	2	3
CSE435-CO3	2	3	3	3	2	1	1	2	2	3	2	3
CSE435-CO4	2	3	3	3	3	1	1	2	3	3	2	2
CSE435-CO5	2	3	3	2	3	1	1	2	3	3	2	2
CSE435-CO6	1	2	2	2	3	1	1	2	3	2	2	3

School: SET		**Batch : 2019-2023**	
Program: B-TECH		**Current Academic Year: 2019-20**	
Branch: CSE		**Semester:**	
1	Course Code	CSA041	Course Name- **Information Retrieval**
2	Course Title	**Information Retrieval**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	**Students will try to learn:** 1. The theoretical basis behind the standard models of IR, 2. The difficulty of representing and retrieving documents, images, speech, etc., 3. To implement, run and test a standard IR system, 4. The standard methods for Web indexing and retrieval, 5. The techniques from natural language processing, artificial intelligence, and integrate with Information Retrieval.	
6	Course Outcomes	On successful completion of this module students will be able to: 7. ***Distinguish*** the basic concepts and techniques in Information Retrieval; 8. ***Illustrate*** how statistical models of text can be used to solve problems in Information Retrieval; 9. ***Demonstrate*** the importance of data structures: 10. ***Interpret*** the access to the information in large bodies of text; 11. ***Build*** a document retrieval system, through the practical sessions, including the implementation of a relevance feedback system; 12. ***Evaluate*** how combined models of language and image processing can enhance document retrieval;	
7	Course Description	This course introduces neural computational paradigm for critical & implementable understanding for pattern based problem areas.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction to Information Retrieval, History of IR and Components of IR	CO1
	B	Information Retrieval vs Data Retrieval	CO1
	C	The role of artificial intelligence (AI) in IR, **Cross-**	CO1, CO2

		Lingual Retrieval			
	Unit 2	**Models of Information Retrieval**			
	A	Basic IR models & Retrieval strategies – Vector-space model, Probabilistic IR, Language models			CO1, CO2
	B	Retrieval strategies : Extended Boolean retrieval, Latent Semantic Indexing, Neural network, Genetic			CO1, CO2
	C	Inverted indices – Documents, Counts, Positions, Fields and Extents, Scores and Ordering			CO1, CO2
	Unit 3	**Query Languages**			
	A	Query Languages for IR			CO1,CO2,CO3
	B	Structural Queries			CO2,CO3
	C	Advanced Query Operations			CO2,CO3
	Unit 4	**DOCUMENT TEXT MINING**			
	A	Text Searching			CO3,CO4
	B	Document Clustering			CO3,CO4,CO5
	C	Text Indexing, Preprocessing and File Organization			CO3,CO4,CO5
	Unit 5	**Applications & Case Studies**			
	A	Multimedia Information Retrieval			CO3,CO5,CO6
	B	Meta-Ranking			CO4,CO5,CO6
	C	Web Search			CO4,CO5,CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. C. Manning, P. Raghavan, and H. Schutze, Introduction to Information Retrieval, Cambridge University Press, 2008. 2. Ricardo Baeza -Yates and Berthier Ribeiro - Neto, Modern Information Retrieval: The Concepts and Technology behind Search 2nd Edition, ACM Press Books 2011 3. Bruce Croft, Donald Metzler and Trevor Strohman, Search Engines: Information Retrieval in Practice, 1st Edition Addison Wesley, 2009. 4. Mark Levene, An Introduction to Search Engines and Web Navigation, 2nd Edition Wiley, 2010.			
	Other References	1. Stefan Buettcher, Charles L. A. Clarke, Gordon V. Cormack, Information Retrieval: Implementing and Evaluating Search Engines, The MIT Press, 2010. 2. Ophir Frieder "Information Retrieval: Algorithms and Heuristics: The Information Retrieval Series", 2nd Edition, Springer, 2004. 3. Manu Konchady, "Building Search Applications: Lucene, Ling Pipe", and First Edition, Gate Mustru Publishing, 2008.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-1. ***Distinguish*** the basic concepts and techniques in Information Retrieval;	PO2, PO5, PO12
2.	CO-2. ***Illustrate*** how statistical models of text can be used to solve problems in Information Retrieval;	PO2, PO5, PO6, PO12
3.	CO-3. ***Demonstrate*** the importance of data structures:	PO2, PO3, PO4, PO5, PO12
4.	CO-4. ***Interpret*** the access to the information in large bodies of text;	PO2, PO3, PO10, PO12
5.	CO-5. ***Build*** a document retrieval system, through the practical sessions, including the implementation of a relevance feedback system;	PO2, PO3, PO5, PO9, PO10
6.	CO-6. ***Evaluate*** how combined models of language and image processing can enhance document retrieval;	PO5, PO9, PO10, PO12

PO and PSO mapping with level of strength for Course Name Information Retrieval (Course Code CSE041)

Course Objectives	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
IR-CO1	1	2	1	1	3	2			1	2		3
IR -CO2	2	2	2	2	2	2			2	2		3
IR -CO3	2	3	3	3	2	1			2	3		3
IR -CO4	2	3	3	3	3	1			3	3		2
IR -CO5	2	3	3	2	3	1			3	3		2
IR -CO6	1	2	2	2	3	1			3	2		3

1. Addressed to ***Slight (Low=1) extent*** ***2.*** Addressed to ***Moderate (Medium=2) extent***
3. Addressed to ***Substantial (High=3) extent***

School: SET		**Batch : 2019-2023**	
Program: B.Tech		**Current Academic Year: 2019-20**	
Branch: CSE AI/ML		**Semester:**	
1	Course Code	**CSA051**	
2	Course Title	ML for Networking	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	1. Learn 2. learning . 3. Developing	
6	Course Outcomes	Students will be able to: CO1: CO2: CO3: CO4: CO5:	
7	Course Description		
8	Outline syllabus		CO Mapping
	Unit 1	**Vulnerability Analysis for computer networks**	
	A	Importance of vulnerability assessments, Steps to conduct vulnerability assessment. Manual Vulnerability assessment	CO1,
	B	AI for vulnerability assessment, ML techniques for Vulnerability assessment.	CO1
	C	Hidden Markov Model for Information security, Security applications of SVM	CO1
	Unit 2	**ML for Network Protection**	
	A	network packet parameters, regression to predict the network packet parameters	CO2
	B	classes of network attacks, classification to identify different classes of network attacks	CO2
	C	forensic analysis, clustering for forensic analysis	CO2
	Unit 3	**Network traffic analysis**	
	A	Understanding normal and anomalous network	CO3

		behavior, Monitoring Network Traffic			
	B	Key Network Traffic Analysis Features			CO3
	C	Applying AI to Network Analytics			CO3
	Unit 4	**Traffic prediction and classification**			
	A	ML techniques for traffic classification			CO4
	B	ML techniques for traffic prediction			CO4
	C	Case study/ use cases on ML based traffic prediction and classification			CO4
	Unit 5	**ML for Computer Networks**			
	A	Automated network protocol and architecture design			CO5
	B	Automated network resource scheduling and decision making			CO5
	C	Improving the comprehension of network systems			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Guide to Vulnerability Analysis for Computer Networks and Systems: An Artificial Intelligence Approach edited by Simon Parkinson, Andrew Crampton, Richard Hill			
	Other References	https://dzone.com/articles/machine-learning-for-cybersecurity-101			

School: SET		**Batch : 2019-2023**		
Program: B-TECH		**Current Academic Year: 2019-20**		
Branch: CSE		**Semester:**		
1	Course Code	**CSA052**	Course Name: Fuzzy Logic	
2	Course Title	Fuzzy Logic		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	Elective		
5	Course Objective	**Students will try to learn:** 34. The concepts of fuzzy sets, 35. Knowledge representation using fuzzy rules, 36. Approximate reasoning and fuzzy inference systems, 37. Fuzzy logic control and other machine intelligence applications of fuzzy logic.		
6	Course Outcomes	Students will be able to: CO-25. ***Recognize*** basic mathematical elements of the theory of fuzzy sets**.** CO-26. ***Illustrate*** the differences and similarities between fuzzy sets and classical sets theories. CO-27. ***Apply*** fuzzy logic with emphasis on their use in the intelligent systems. CO-28. ***Interpret*** fuzzy proposition using fuzzy set membership function CO-29. ***Integrate*** inference applications in the area of control and robotics. CO-30. ***Support*** fuzzy inference systems in the design of Control and intelligent or humanistic systems.		
7	Course Description	Basic concepts of Set Theory with functions and relational model.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction**		
	A	Review of classical set theory and related concepts		CO1, CO2
	B	Fuzzy sets and related concepts; membership functions, operations, algebra, etc.		CO1, CO2

	C	Mapping fuzzy sets and extension principle			CO1, CO2
	Unit 2	**Fuzzy Logic;**			
	A	Fuzzy numbers, Fuzzy relations			CO1, CO2
	B	Fuzzy logic and relationship to binary logic			CO1, CO2
	C	Fuzzy arithmetic concepts			CO1, CO2
	Unit 3	**Fuzzy propositions:**			
	A	classical propositions			CO2, CO3
	B	classical inference			CO2, CO3
	C	Fuzzy Logic Membership Functions.			CO2, CO3
	Unit 4	**Fuzzy inference System**			
	A	Fuzzy inference using conditional propositions – Fuzzy inference systems			CO3, CO4
	B	Learning algorithms for intelligent systems design			CO3, CO4
	C	Mamdani Fuzzy Model			CO3, CO4, CO5
	Unit 5	**Applications and further studies**			
	A	Application fuzzy logic with Matlab.			CO4, CO5, CO6
	B	Applications in robotics.			CO4, CO5, CO6
	C	Applications in control.			CO4, CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	5. Li-Xin Wang, *A Course in Fuzzy Systems and Control*, (Prentice-Hall, 1996) 6. Fuzzy Logic With Engineering Applications, T.J. Ross, McGraw Hill, 1995.			
	Other References	1. Fuzzy Sets Engineering, Witold Pedrycz, CRC Press, 1995. 2. Fuzzy Sets and Fuzzy Logic: Theory and Applications, George Klir and Bo Yuan, Prentice Hall, 1995. 3. Fuzzy Control, Farinwata, Filev and Langari, Wiley, 2000			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-1. ***Recognize*** basic mathematical elements of the theory of fuzzy sets**.**	PO1, PO2, PO12
2.	CO-2. ***Illustrate*** the differences and similarities between fuzzy sets and classical sets theories.	PO1, PO2, PO10, PO12

3.	CO-3. ***Apply*** fuzzy logic with emphasis on their use in the intelligent systems.	PO5, PO6, PO11, PO12
4.	CO-4. ***Interpret*** fuzzy proposition using fuzzy set membership function	PO3, PO4, PO5
5.	CO-5. ***Integrate*** inference applications in the area of control and robotics.	PO3, PO4, PO5, PO9, PO12
6.	CO-6. ***Support*** fuzzy inference systems in the design of Control and intelligent or humanistic systems.	PO1, PO2, PO3, PO4, PO5, PO9, PO12

PO and PSO mapping with level of strength for Course Name Fuzzy Logic **(Course Code CSA052)**

Course Objectives	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
FL-CO1	3	3	2	1	1					1		3
FL -CO2	3	3	2	2		2				2		2
FL -CO3	2	2	2	2	3	3			2	2	2	3
FL -CO4	1	2	3	3	3	2			2	2	2	2
FL -CO5	1	2	3	3	3	2			3	2	2	2
FL -CO6	3	3	3	3	3	2	2	1	3	2	2	2

School: SET		**Batch : 2019-2023**	
Program: B.Tech.		**Current Academic Year: 2019-20**	
Branch:CSE		**Semester:**	
1	Course Code	CSA062	Course Name- **RECOMENDER SYSTEMS**
2	Course Title	**RECOMENDER SYSTEMS**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	3) To INTRODUCE fundamental techniques in recommender systems. 4) To introduce the ideas of Non-personalized and project-association recommenders through content-based and collaborative techniques 5) To become familiar with to various approaches for building recommender systems including collaborative, content-based, knowledge-based, and hybrid methods.	
6	Course Outcomes	After Successful completion of this course the student will be able to: 7) ***Identify*** 8) ***Formulate*** ***9) Solve*** 10) ***Analyze*** 11) ***Integrate*** 12) ***Justify***	
7	Course Description	Recommender systems offer personalized access to online information in product catalogs, social media networks, and document collections, among other applications. It will introduce students to various approaches for building recommender systems including collaborative, content-based, knowledge-based, and hybrid methods.	
8	Outline syllabus		CO Mapping

	Unit 1	**Introduction**			
	A	Introduction to to Recommender Systems, Neighborhood-based methods Recommendation			CO1, CO2
	B	Information retrieval.			CO1, CO2
	C	Knowledge sources. Neighbourhood-based methods.			CO1, CO2
	Unit 2	**Model-based Collaborative Recommendation**			
	A	Model-based Collaborative Recommendation Dimensionality reduction. Regression: Slope1 and SLIM models. Association rules and Naïve Bayes models,			CO1, CO2
	B	Factorization Methods of Collaborative Recommendation, Latent factor models.			CO1, CO2
	C	Optimization techniques. Singular value decomposition, constrained matrix factorization.			CO1, CO2, CO6
	Unit 3	**Content-based and Knowledge-based Recommendation**			
	A	Content-based Recommendation Feature representation, extraction, and selection.			CO1, CO3
	B	User profiles. Learning models.			CO1, CO3, CO4
	C	Knowledge-based Recommendation Constraint-based recommendation. Critiquing systems.			CO1, CO3, CO4, CO6
	Unit 4	**Hybrid recommendation and Evaluation**			
	A	Hybrid Recommendation Complementarities between recommendation techniques and knowledge sources..			CO1,CO5
	B	Combining recommendation methods. Types of evaluation for recommender systems			CO1,CO5
	C	Evaluation design. Prediction metrics and ranking metrics. A/B Testing			CO1,CO5, CO6
	Unit 5	Context-aware recommendation			
	A	Context effects in recommendation. Types and representations of context.			CO1,CO2,CO3, CO4,CO5, CO6
	B	Pre-filtering, post-filtering and contextual modeling.			CO1,CO2,CO3, CO4,CO5, CO6
	C	Temporal and location-sensitive models			CO1,CO2,CO3, CO4,CO5, CO6
	Mode of examination	Theory			
	Weightage	CA	MTE	ETE	
		30%	20%	50%	

	Distribution				
	Text book/s *	Aggarwal, C. C. Recommender Systems: The Textbook. Springer 2019. ISBN 978-3-319-29657-9. Available through the DePaul library.			
	Other References	http://www.deitel.com/ResourceCenters/Web20/RecommenderSystems/RecommenderSystemsCourseSyllabi/tabid/1321/Default.aspx			

SPECILIZATION	TERM	Course Code	Course	Credits
BLOCKCHAIN	II	CSB102	Blockchain Basics	2
	III	CSB201	Cryptography	4
	IV	CSB202	Programming in GO	3
	V	CSC301	Blockchain for Buisness.	3
	VI	CSB302	Smart contracts using hyperledger Fabric	4
	VII	CSB401	Smart contracts using Etherium	4
	PE1	CSB011	Bitcoin and Cryptocurrencies	3
	PE2	CSB021		3
	PE3	CSB031	Open source for Blockchain using Hyperledger	3
	PE4	CSB041	Blockchain using Multichain	3
	PE5	CSB051	Cryptocurrency with Etherium	3
	PE6	CSB061	Implementing B;ockchain on Cloud	3

1	Course Code	**CSB 102**
2	Course Title	BLOCKCHAIN BASICS
3	Credits	2
4	Contact Hours	2-0-0
5	Course Objective	The objective of the course is to introduce basic fundamental concepts in Blockchain with a practical approach in understanding them. Thereby to visualize the scope of blockchain & its role in futuristic development.
6	Course Outcomes (CO)	After the completion of this course, students will be able to: CO-1. **Recognize** goals of Blockchain CO-2. **Understanding** Smart Contracts, transactions in Blockchain CO-3. **Perform** various cryptographic algorithms. CO-4. **Analyze** Blockchain in finace CO-5. **Understand** Permissioned Blockchain CO-6. **Understand** Security aspects of blockchain
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	**Introduction**
8.02	Unit A Topic 1	Overview of Blockchain, Public Ledgers, Bitcoin, Blockchain 2.0, Smart Contracts, Block in a Blockchain, Transactions
8.03	Unit A Topic 2	Distributed Consensus, Cryptocurrency to Blockchain 2.0, Permissioned Model of Blockchain.
8.04	Unit A Topic 3	Cryptographic Hash Function, Properties of a hash function, Hash pointer and Merkle tree, Digital Signature, Public Key Cryptography, A basic cryptocurrency.
8.05	Unit B	**Bitcoin Basics and Consensus**
8.06	Unit B Topic 1	Creation of coins, Payments and double spending, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block

		propagation and block relay.
8.07	Unit B Topic 2	Distributed consensus in open environments,Consensus in a Bitcoin network, Proof of Work (PoW) – basic introduction, HashcashPoW, Bitcoin PoW
8.08	Unit B Topic 3	Attacks on PoW and the monopoly problem,Proof of Stake, Proof of Burn and Proof of Elapsed Time, The life of a Bitcoin Miner, Mining Difficulty, Mining Pool.
8.09	Unit C	**Permissioned Blockchain**
8.10	Unit C Topic 1	Permissioned model and use cases, Design issues for Permissioned blockchains, Execute contracts, State machine replication, Consensus models for permissioned blockchain
8.11	Unit C Topic 2	Distributed consensus in closed environment, Paxos, RAFT Consensus, Byzantine general problem
8.12	Unit C Topic 3	Byzantine fault tolerant system, Lamport-Shostak-Pease BFT Algorithm, BFT over Asynchronous systems.
8.13	Unit D	**Blockchain in Financial Service**
8.14	Unit D Topic 1	Cross border payments, Steller and Ripple protocols, Project Ubin, Know Your Customer (KYC)
8.15	Unit D Topic 2	Privacy Consents, Mortgage over Blockchain, Blockchain enabled Trade,
8.16	Unit D Topic 3	We Trade – Trade Finance Network, Supply Chain Financing
8.17	Unit E	**Blockchain Security**
8.18	Unit E Topic 1	Security properties, Security considerations for Blockchain, Intel SGX, Identities and Policies,
8.19	Unit E Topic 2	Membership and Access Control, Blockchain Crypto Service Providers,
8.20	Unit E Topic 3	Privacy in a Blockchain System, Privacy through Fabric Channels, Smart Contract Confidentiality.
9	**Course Evaluation: Continuous Assessment-30 Marks**	
9.1	Attendance	--

9.2	Homework	2 assignments, no weight
9.3	Quizzes	7 best quizzes (based on assignments) - 15 marks
9.4	Project	
9.5	Any other	NO
9.6	**Mid Term Examination**	**20 Marks**
9.7	**End Term Examination**	**50 Marks**
10	**Reading Content**	
10.1	Text book*	1. Blockchain: Blueprint for a New Economy", by Melanie Swan 2. Blockchain: The blockchain for beginners guide to blockchain technology and leveraging blockchain programming", by Josh Thompsons
10.2	other references	1. Blockchain Basics by Daniel Drescher

SHARDA UNIVERSITY
Beyond Boundaries

PO and PSO mapping with level of strength for Course Name Artificial Intelligence **(Course Code CSE409)**

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1	--	--	3	-	2	2	-	-	3	-	-	-
CO2	1	2	3	3	3	--	--	1	1	1	-	-	1	2	-	-
CO3	3	3	3	3	--	2	--	1	2	1	3	2	-	-	-	-
CO4	1	1	1	1	-	3	--	1	1	-	3	1	1	1	1	1
CO5	1	1	1	1	-	-	--	1	3	1	3	2	1	1	1	1
CO6	2	2	2	2	3	3	3	1	2	2	3	2	2	2	1	1

1-Slight (Low) **2-Moderate (Medium)** **3-Substantial (High)**

1	Course Code	**CSB201**
2	Course Title	Cryptography
3	Credits	4
4	Contact Hours	3-0-2
5	Course Objective	**COURSE OBJECTIVES –**
6	Course Outcomes (CO)	After the completion of this course, students will be able to:
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	
8.02	Unit A Topic 1	Introduction to cryptography, Introduction to security attacks, services and mechanism,. Classical encryption techniques substitution Ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers
8.03	Unit A Topic 2	**Conventional Encryption**: Conventional encryption model, classical encryption techniques substitution ciphers and transposition ciphers, cryptanalysis, stereography, stream and block ciphers. Modern Block Ciphers: Block ciphers principals, Shannon's theory of confusion and diffusion
8.04	Unit A Topic 3	Data encryption standard(DES), strength of DES, differential and linear crypt analysis of DES, block cipher modes of operations, triple DES, IDEA encryption and decryption, strength of IDEA, confidentiality using conventional encryption, traffic confidentiality, key distribution, random number generation.
8.05	Unit B	**Introduction to graph**
8.06	Unit B Topic 1	Introduction to graph, ring and field, prime and relative prime numbers, modular arithmetic, Fermat's and Euler's theorem, Euclid's Algorithm, Extended Euclidean

		Algorithm
8.07	Unit B Topic 2	Advanced Encryption Standard (AES) , Chinese Remainder theorem, discrete logarithms. Principals of public key crypto systems, RSA algorithm, security of RSA
8.08	Unit B Topic 3	key management, Diffle-Hellman key exchange algorithm, introductory idea of Elliptic curve cryptography, Elganel encryption.
8.09	Unit C	**Message Authentication and Hash Function**
8.10	Unit C Topic 1	Authentication requirements, authentication functions, message authentication code, hash functions, birthday attacks
8.11	Unit C Topic 2	, security of hash functions and MACS, MD5 message digest algorithm, Secure hash algorithm(SHA).
8.12	Unit C Topic 3	Digital Signatures: Digital Signatures, authentication protocols, digital signature standards (DSS), proof of digital signature algorithm.
8.13	Unit D	**Key Management and distribution**
8.14	Unit D Topic 1	Key Management and distribution: Symmetric key distribution,
8.15	Unit D Topic 2	Diffie-Hellman Key Exchange, Public key distribution,
8.16	Unit D Topic 3	X.509 Certificates, Public key Infrastructure.
8.17	Unit E	**Authentication Applications**
8.18	Unit E Topic 1	Kerberos and X.509, directory authentication service, electronic mail security-pretty good privacy (PGP)
8.19	Unit E Topic 2	S/MIME. Applications of Cryptographic Hash Functions
8.20	Unit E Topic 3	Message Authentication Codes and Digital Signatures.
9	**Course Evaluation: Continuous Assessment-30 Marks**	
9.1	Attendance	--
9.2	Homework	2 assignments, no weight

9.3	Quizzes	7 best quizzes (based on assignments) - 15 marks
9.4	Project	
9.5	Any other	NO
9.6	**Mid Term Examination**	**20 Marks**
9.7	**End Term Examination**	**50 Marks**
10	**Reading Content**	
10.1	Text book*	***A Graduate Course in Applied Cryptography*** **by D. Boneh and V. Shoup**
10.2	other references	Research Papers

1	Course Code	**CSB302**
2	Course Title	Smart contract with Hyperledger Fabric
3	Credits	4
4	Contact Hours	3-0-2
5	Course Objective	**COURSE OBJECTIVES –**
6	Course Outcomes (CO)	After the completion of this course, students will be able to:
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	
8.02	Unit A Topic 1	Introduction to Fabric, Features, Roles Fabric Architecture/Model - Overview
8.03	Unit A Topic 2	Designing Network - Vehicle Trace Case Study walk through, Step by step network design of use case
8.04	Unit A Topic 3	Introducing Nodes, orderer, CA, MSP, Consortium, Introduction to channels, Peer, Ledger,Chaincode.
8.05	Unit B	
8.06	Unit B Topic 1	In Depth Fabric Network - Transaction
8.07	Unit B Topic 2	Life Cycle (Initiate,Execute, Response,Deliver, Validate)
8.08	Unit B Topic 3	Private Data, Orderer, More on chaincode (Chaincode Interface, Stub Interface, Logging)
8.09	Unit C	

8.10	Unit C Topic 1	Introduction to Hyperledger Composer, Advantages of Composer. How to build chaincode in Fabric?
8.11	Unit C Topic 2	Development Environment Setup (Prerequisite installation, Fabric binaries setup, Tools installation),Creating Channels, Environment testing
8.12	Unit C Topic 3	Chaincode Key Concepts , Chaincode for developers, Chaincode for Operators, System Chaincodes Vehicle Trace Chain
8.13	Unit D	**Blockchain in Financial Service**
8.14	Unit D Topic 1	Chaincode development using NodeJS/GO, Unit testing
8.15	Unit D Topic 2	Deploying Chaincode to network Client Application
8.16	Unit D Topic 3	Development Client Application Development using Node JS SDK
8.17	Unit E	**Blockchain Security**
8.18	Unit E Topic 1	Using Hyperledger Explorer for block information Querying - Querying State data and Transaction log - (Query inside client App)
8.19	Unit E Topic 2	Programmatic Access control Hyperledger
8.20	Unit E Topic 3	Composer Deploying a simple Business network using Composer
9	**Course Evaluation: Continuous Assessment-30 Marks**	
9.1	Attendance	--
9.2	Homework	2 assignments, no weight
9.3	Quizzes	7 best quizzes (based on assignments) - 15 marks
9.4	Project	
9.5	Any other	NO

9.6	**Mid Term Examination**	**20 Marks**
9.7	**End Term Examination**	**50 Marks**
10	**Reading Content**	
10.1	Text book*	*A Step by Step guide to Enterprise Blockchain with Hyperledger Fabric: Develop De-centralized applications with Hyperledger Fabric* by Mustafa Husain (Author), Sandeep Kumar (Author)
10.2	other references	Blockchain Development with Hyperledger: Build decentralized applications with Hyperledger Fabric and Composer

1	Course Code	**CSB051**
2	Course Title	Cryptocurrency with Ethereum
3	Credits	3
4	Contact Hours	3-0-0
5	Course Objective	**COURSE OBJECTIVES –** 1. To have a basic understanding of blockchain technology and cryptocurrency 2. To study the security issues and safeguards related to bitcoin trading
6	Course Outcomes (CO)	After the completion of this course, students will be able to: 1. Build efficient blockchain models to carry out advanced tasks with the practical approach. 2. Evaluate the use and risks involved with Blockchain
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	
8.02	Unit A Topic 1	Course Description and Blockchain, Disruption/News: Price Rise, Distinction between Blockchain vs Cryptocurrency vs Token
8.03	Unit A Topic 2	Definition – diagram: Pillars of Blockchain, Industry Applications of Blockchain: Government, Healthcare, History of Centralized Services
8.04	Unit A Topic 3	trusted third party: Shift from gold standard to flat currency to Hashcash/digital currency (look at BEM) / Bitcoin, Trusstles system, Immutability, Security, Privacy, Anti-fragility, etc.
8.05	Unit B	
8.06	Unit B Topic 1	Cryptocurrency and Markets: Cryptocurrencies - talk about Bitcoin
8.07	Unit B Topic 2	Ethereum, Where is the value - what are people investing in?
8.08	Unit B Topic 3	Methods to purchase Bitcoins/Ethereum Setting up a Wallet.

8.09	Unit C	
8.10	Unit C Topic 1	Issues with Blockchain: Security and Safeguards, Protection from attackers, Hacks on exchanges
8.11	Unit C Topic 2	What is stopping adoption? , Scalability problems
8.12	Unit C Topic 3	Network attacks to destroy bitcoin,Legal adoption in various countries and laws.
8.13	Unit D	**Blockchain in Financial Service**
8.14	Unit D Topic 1	
8.15	Unit D Topic 2	
8.16	Unit D Topic 3	
8.17	Unit E	**Blockchain Security**
8.18	Unit E Topic 1	
8.19	Unit E Topic 2	Membership and Access Control, Blockchain Crypto Service Providers,
8.20	Unit E Topic 3	Applications: Token Systems, Financial derivatives, Identity and Reputation Systems, Decentralized File Storage, Decentralized Autonomous Organizations, Further Applications
9	**Course Evaluation: Continuous Assessment-30 Marks**	
9.1	Attendance	--
9.2	Homework	2 assignments, no weight
9.3	Quizzes	7 best quizzes (based on assignments) - 15 marks
9.4	Project	
9.5	Any other	NO
9.6	**Mid Term Examination**	**20 Marks**
9.7	**End Term Examination**	**50 Marks**

10	**Reading Content**	
10.1	Text book*	**Blockchain: The Complete Step-by-step Guide to Understanding Blockchain and the Technology Behind It by Jay Isaac**
10.2	other references	Research Papers

SPECILIZATION	TERM	Course Code	Course	Credits
Cyber Security & Forensics	II	CSC102	Introduction To Cyber Security & Laws	2
	III	CSC201	Digital forensics	4
	IV	CSC202	Cryptography Network Security	3
	V	CSC301	Ethical Hacking	3
	VI	CSC302	Security Architecture	4
	VII	CSI401	IOT security	4
	PE1	CSC011		3
	PE2	CSC021	Intro. To block chain	3
	PE3	CSC031	Info. Security & audit Monitoring	3
	PE3	CSC032	Web Application Security	3
	PE4	CSC041	Cloud security	3
	PE4	CSC042	Web & Mobile App. Security	3
	PE5	CSC051	Penetration Testing	3
	PE5	CSC052	Exploit Writing	3
	PE6	CSC061	Disaster Recovery Management	3
	PE6	CSC062	Risk management	3

SHARDA UNIVERSITY
Beyond Boundaries

School: SET		**Batch :2019**		
Program: B.Tech		**Current Academic Year:**		
Branch:CSE		**Semester: V**		
1	Course Code	CSC201	Course Name: B.Tech	
2	Course Title	**Digital forensics**		
3	Credits	4		
4	Contact Hours (L-T-P)	3-0-2		
	Course Status	Elective		
5	Course Objective	5. Provide students with an overview of the techniques used in digital forensics 6. Gain insight into the challenges forensics 7. Provide the students with practice on applying digital forensics techniques 8. Enhance students communication and problem solving skills		
6	Course Outcomes	Students will be able to: **CO1:** have a fundamental understanding of Digital Forensics and how resultant evidence can be applied within legal cases. **CO2:** display their competence in recovering files, network forensics, password cracking **CO3:** Evaluate the effectiveness of available digital forensics tools and use them in a way that optimizes the efficiency and quality of digital forensics investigations.		
7	Course Description	This course introduces students to basics of Digital Forensics. Make them apply appropriate skills and knowledge in solving computer forensics problems.		
8	Outline syllabus			CO Mapping
	Unit 1	**INTRODUCTION TO COMPUTER FORENSICS**		
	A	History of Forensics – Computer Forensic Flaws and Risks		CO1
	B	Rules of Computer Forensics – Legal issues – Digital Forensic Principles		CO1,CO3
	C	Digital Environments – Digital Forensic Methodologies		CO1,CO3
	Unit 2	**AN OVERVIEW OF DIGITAL FORENSICS INVESTIGATION**		
	A	Live forensics and investigation –digital evidence		CO1,CO3
	B	seizure methodology factors limiting the whole sale seizure of hardware- Demystifying computer/ cyber crime		CO1,CO3
	C	explosion of networking – explosion of wireless networks – interpersonal communication		CO1,CO2,CO3
	Unit 3	**DATA FORENSICS**		
	A	Recovering deleted files and deleted partitions – deleted file recovery tools –		CO1,CO2,CO3
	B	deleted partitioned recovery tools – data acquisition and		CO1,CO2,CO3

		duplication	
	C	data acquisition tools – hardware tools – backing up and duplicating data.	CO1,CO2,CO3
	Unit 4	**ROUTER FORENSICS AND NETWORK FORENSICS**	
	A	overview of Routers – Hacking Routers – Investigating Routers	CO1,CO2,CO3
	B	Investigating Wireless Attacks – Basics of wireless - Wireless Penetration Testing	CO1,CO2, CO3
	C	Direct Connections to Wireless Access Point – Wireless Connect to a Wireless Access Point.	CO1,CO2, CO3
	Unit 5	**E-MAIL FORENSICS AND STEGANOGRAPHY**	
	A	Forensics Acquisition – Processing Local mail archives –	CO1,CO3
	B	Processing server level archives – classification of steganography	CO1, CO3
	C	categories of steganography in Forensics – Types of password cracking.	CO1,CO2, CO3
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	7. Anthony Reyes, Jack Wiles, "Cybercrime and Digital Forenscis", Syngress Publishers, Elsevier 2007. 8. John Sammons, "The Basics of Digital Forensics", Elsevier 2012	
	Other References	10. Linda Volonins, Reynalds Anzaldua, "Computer Forensics for dummies", Wiley Publishing 2008.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** have a fundamental understanding of Digital Forensics and how resultant evidence can be applied within legal cases.	PO1,PO2,PO8,PO12,PSO3,PSO4
2.	**CO2:**display their competence in recovering files, network forensics, password cracking	PO3,PO8,PO9,PSO2,PSO4
3.	**CO3:** Evaluate the effectiveness of available digital forensics tools and use them in a way that optimizes the efficiency and quality of digital forensics investigations.	PO1,PO4,PO6,PO7,PO10,PO11,PSO1,PSO5

PO and PSO mapping with level of strength for Course Name Digital Forensics (Course Code CSC301)

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	1	-	-	--	--	--	1	-	-	-	3	-	-	1	1	
	CO2	-	-	3	-	--	--	--	2	2	-	-	-	-	2	-	1	-
	CO3	3	-	-.	3	--	3	3	-	-	2	3	-	2	-	-	-	3

School: SET		**Batch :2019-22**	
Program: B.TECH		**Current Academic Year: 2019-19**	
Branch: CSE		**Semester: VI**	
1	Course Code	CSC202	Course Name:
2	Course Title	**Cryptography and Network Security**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	To provide students with an overview cryptography and related algorithm which is required during data communication in computer networks which are the basic building blocks of different organizations throughout world with respect to security.	
6	Course Outcomes	After the successful completion of this course, students will be able to : CO1: Analyze the conventional ciphers and stenographic technique which are basically designed to maintain confidentiality. CO2: Compare the algorithms developed in modern cryptographic era. CO3: Establish the mathematical background of the ciphers proposed in symmetric and asymmetric key cryptography. CO4: Comprehend the working knowledge of the ciphers & protocols during data communication to maintain security	
7	Course Description	This course introduces concepts of Cryptography & all the mathematical calculations related to it. It also imparts the knowledge of digital signature & message authentication.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Computer Security Concepts- OSI security Architecture, Security attacks, Services, mechanism, model of network security	CO1,CO2,CO3
	B	Classical encryption techniques- Substitution Cipher(Mono-alphabetic, Poly-alphabetic), Transposition cipher, Stenography	CO1,CO2,CO3
	C	Block Cipher- Encryption Principles, DES & strength of DES	CO1,CO2,CO3
	Unit 2	**Mathematics of Cryptography**	
	A	Eucledian, Extended Eucledian Algorithm, EulersTotient Function , Ferment little Theorem, Eulers theorem	CO3
	B	Primality Testing-Miller Rabin test, Chinese Remainder Theorem	CO3,CO4
	C	Exponential- square and multiply method, Discrete Logarithm	CO3,CO4
	Unit 3	**Asymmetric Cryptography & Key Exchange**	
	A	Public Key cryptography-RSA, Cryptanalysis of RSA	CO2,CO3
	B	Key management & distribution: KDC	CO2,CO3
	C	Diffie Hellman key exchange	CO3,CO4
	Unit 4	**Digital Signatures**	
	A	User Authentication protocol- Kerberos, Digital Signature –RSA, Elgamal	CO2,CO3

	B	DSS, Data integrity algorithms-Hash Functions			CO2,CO4
	C	MD5, SHA-512			CO2,CO4
	Unit 5	**Message Authentication & hash function**			
	A	Authentication requirement & functions, Message Authentication Code			CO1,CO2
	B	Security of Hash function & MAC			CO2,CO4
	C	Secure HASH & MAC algorithm.			CO2
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	10. Stallings, W., "Cryptography and Network Security – Principles and Practices", Prentice Hall of India, Fourth Edition. 11. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.			
	Other References	4. Behrouz A. Forouzan, "Cryptography And Network Security"- McGraw Hill 5. Internet as a resource for reference			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: Analyze the conventional ciphers and stenographic technique which are basically designed to maintain confidentiality.	PO1,PO2,PO11,PSO1
2.	CO2: Compare the algorithms developed in modern cryptographic era. (ABET program outcomes a and j)	PO1,PO2,PO3,PSO1,PSO2
3.	CO3: Establish the mathematical background of the ciphers proposed in symmetric and asymmetric key cryptography.	PO1,PO2,PSO1,PSO2
4.	CO4: Comprehend the working knowledge of the ciphers & protocols during data communication to maintain security	PO1,PO2,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name: Cryptography and Network Security (Course Code CSC202)

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	3	1	1	1	1	1	1	1	2	3	2	3	3	1	1	1
	CO2	3	3	3	1	1	2	2	2	2	1	1	1	3	3	1	2	2
	CO3	3	3	2	2	2	1	2	2	2	1	1	1	3	3	1	2	1
	CO4	3	3	2	2	1	1	1	2	2	1	1	2	3	3	1	2	2

School: SET		**Batch :2019**	
Program: B.TECH		**Current Academic Year:**	
Branch:CSE		**Semester: VI**	
1	Course Code	CSC301	Course Name B. Tech
2	Course Title	**Ethical Hacking**	
3	Credits	3	
4	Contact Hours (L-T-P)	2-0-2	
	Course Status		
5	Course Objective	9. Students will learn fundamentals of ethical hacking via lectures and assignments. 10. Students will investigate various problem and regulation of ethical hacking through projects and assignments.	
6	Course Outcomes	Students will be able to: **CO1:**Describe and understand the basics of the ethical hacking **CO2:**Perform the foot printing and scanning **CO3:** Demonstrate the techniques for system hacking **CO4:**Characterize the malware and their attacks and detect and prevent them	
7	Course Description	This course aims to introduce students to the fundamental concepts and techniques in ethical hacking, and giving students an overview of attack and securing methods	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Ethical Hacking**	
	A	Security Fundamental, Security testing, Hacker and Cracker, Descriptions	CO1, CO2
	B	Test Plans-keeping It legal, Ethical and Legality	CO1, CO2
	C	The Attacker's Process, The Ethical Hacker's Process, Security and the Stack	CO1, CO2
	Unit 2	**Footprinting and scanning**	
	A	Information Gathering, Determining the Network Range, Identifying Active Machines	CO1, CO2, CO3
	B	Finding Open Ports and Access Points, OS Fingerprinting Services, Mapping the Network Attack Surface	CO1, CO2, CO3
	C	Enumeration, System Hacking	CO1, CO2, CO3
	Unit 3	**Malware Threats**	
	A	Viruses and Worms, Trojans, Covert Communication	CO2, CO3
	B	Keystroke Logging and Spyware, Malware Counter measures	CO2, CO3

	C	Sniffers, Session Hijacking, Denial of Service and Distributed, Denial of Service			CO2, CO3,CO4
	Unit 4	**Web Server Hacking**			
	A	Web Server Hacking, Web Application Hacking			CO1, CO2
	B	Database Hacking			CO4
	C	Wireless Technologies, Mobile Device Operation and Security, Wireless LANs			CO1, CO2,CO4
	Unit 5	**IDS, Firewalls and Honeypots**			
	A	Intrusion Detection Systems, Firewalls, Honeypots			CO2,CO3
	B	Physical Security, Social Engineering			CO3,CO1
	C	Case Studies			CO4
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Certified Ethical Hacker, Version 9, Second Edition, Michael Gregg, Pearson IT Certification 2. Hacking the Hacker, Roger Grimes, Wiley 3. The Unofficial Guide to Ethical Hacking, Ankit Fadia, Premier Press			
	Other References	1. ISO/IEC 27001:2013			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:**Describe and understand the basics of the ethical hacking	PO1,PO2,PO3,PO4,PO5, PO7.PSO1,PS04
2.	**CO2:**Perform the foot printing and scanning	PO1, PO3, PO4,PO8, PO9, PSO2
3.	**CO3:** Demonstrate the techniques for system hacking	PO1,PO2,PO3,PO4,PO5, PO7.PSO1,PS04
4.	**CO4:**Characterize the malware and their attacks and detect and prevent them	PO9, PO10,PO11, PSO3

PO and PSO mapping with level of strength for Course Name Ethical Hacking Fundamentals (Course Code CSC301)

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	2	3	2	2	----	1	---	1	1	---	----	3	1	1	2	1
	CO2	3	1	1	3	2	--	---	3	2	1	1	1	1	1	---	----	---
	CO3	2	1	3	2	2	----	1	---	1	1	---	----	3	2	2	2	1
	CO4	1	2	2	1	1	--	--	1	3	3	3	2	2	1	3	1	1

School: SET		**Batch: 2019**
Program: B.Tech		**Current Academic Year: 2019-2019**
Branch: CSE		**Semester: VI**
1	Course Code	CCL302
2	Course Title	**Ethical Hacking Lab**
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	• Information security is of critical importance in this generation of digital communication .The objective of this laboratory is to provide students pratical opportunity on data transmission security and data recovery. Simultaneously, complexities associated with threat to security on network are also studied.
6	Course Outcomes	Students will be able to: CO1:Understand the requirement of security CO2:Applyvarios tool for security CO3: The current configuration is meant to allow a space for students to perform tasks to further their understanding of cyber security principles CO4:Apply in-depth knowledge of varios application for encryption techniques.
7	Course Description	Information security (infosec) is a set of strategies for managing the processes, tools and policies necessary to prevent, detect, document and counter threats to digital and non-digital information. Infosec responsibilities include establishing a set of business processes that will protect information assets regardless of how the information is formatted or whether it is in transit, is being processed or is at rest in storage.

8	Outline syllabus		CO Mapping
	Unit 1	Tools	
	A	Passive Reconnaissance using “Who is” and Online tools	CO1,CO2
	B	Active Reconnaissance using “Sampad” and web site details	CO2,CO3
	C	Full Scan, Half Open Scan and Stealth scan using “nmap”	CO1,CO2
	Unit 2	UDP	
	A	UDP and Ping Scanning using “Advance Lan Scanner” and “Superscan”	CO1,CO2
	B	Packet crafting using “Packet creator” tools	CO2,CO3
	C	Exploiting NetBIOS vulnerability	CO2,CO4
	Unit 3	Password cracking	
	A	Password Revelation from browsers and social networking	C03,CO4

		application			
	B	Creating and Analyzing Trojans			CO3,CO4
	C	O S password cracking			CO2,CO3
	Unit 4	Socket programming			CO1,CO3
	A	Change athe address of the port			CO2,CO3
	B	Socket programming:TCP			CO1,CO3
	C	Socket programming:UDP			CO3,CO4
	Mode of examination	Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	-			
	Other References				

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S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: have a fundamental understanding of Digital Forensics and how resultant evidence can be applied within legal cases.	PO1,PO2,PO8,PO12,PSO3,PSO4
2.	CO2:display their competence in recovering files, network forensics, password cracking	PO3,PO8,PO9,PSO2,PSO4
3.	CO3: Evaluate the effectiveness of available digital forensics tools and use them in a way that optimizes the efficiency and quality of digital forensics investigations.	PO1,PO4,PO6,PO7,PO10,PO11,PSO1,PSO5

School: SET		**Batch :2019-22**		
Program: B.TECH		**Current Academic Year: 2019**		
Branch:CSE		**Semester:7**		
1	Course Code	CSC302	Course Name B. Tech	
2	Course Title	**Security Architecture**		
3	Credits	4		
4	Contact Hours (L-T-P)	3-1-0		
	Course Status	UG		
5	Course Objective	11. Students will learn security architecture technologies via lectures and assignments. 12. Students will investigate various problem and regulation of architecture through projects and assignments.		
6	Course Outcomes	Students will be able to: **CO1:**Understand Security system Architecture **CO2:** Analyze Survivability analysis of architecture **CO3:**Definetypes of firewall and IDS **CO4:**Understanding and analysis of system security architecture		
7	Course Description	This course aims to introduce students to the fundamental concepts and techniques in security architecture, and giving students an overview of information security in architecture perspective.		
8	Outline syllabus			CO Mapping
	Unit 1	**Architecture fundamental**		
	A	System architecture: What are system architectures? Architecture styles and properties		CO1
	B	System requirements, Architecture representation		CO1, CO3
	C	Analysis of architecture properties, Architecture trade-offs		CO1, CO3
	Unit 2	**Survivability Analysis and information Malware**		
	A	Survivability concepts, Survivable Network Analysis method		CO1, CO2, CO3
	B	Specification of survivability requirements		CO1, CO2, CO3
	C	The IW threat to government and business		CO1,CO3

	Unit 3	**Firewall**	
	A	Introduction to firewalls – network architectures, types of firewalls, proxies versus filtering routers	CO2, CO3
	B	Security properties and firewalls -complexity and vulnerability, configuration control	CO2, CO3
	C	Security properties and firewalls - changing services, executable content	CO2, CO3
	Unit 4	**Intrusion Detection**	
	A	Types of intrusion detection, architecture support for intrusion detection, current IDS research	CO1, CO2
	B	Anomaly Detection	CO4
	C	Host-based and network-based IDS	CO1, CO2,CO4
	Unit 5	**System Security Architectures**	
	A	Security architectures of operating systems, Distributed application security, system vulnerabilities	CO2
	B	Security architectures of operating systems, Distributed application security	CO3
	C	System vulnerabilities	CO4
	Mode of examination	Theory	
	Weightage Distribution	CA / 30% · MTE / 20% · ETE / 50%	
	Text book/s*		
	Other References	2. ISO/IEC 27001:2013	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** introduction to Architecture	PO1,PO2,PO3,PO4,PO5, PO7.PSO1
2.	**CO2**: Survivability analysis of architecture	PO1, PO4,PO8, PO9, PSO2
3.	**CO3:** Types of firewall and IDS	PO1,PO2,PO3,PO5, PO7.PSO1,PS04
4.	**CO4:** Understanding and analysis of system security architecture	PO9, PO11, PSO3

PO and PSO mapping with level of strength for Course Name: Security Architecture (Course Code CSC302)

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5

	CO 1	3	2	3	2	2	----	1	---	1	1	---	----	3	1	1	2	1
	CO 2	3	1	1	2	2	--	---	3	2	1	1	1	1	1	---	----	---
	CO 3	2	1	3	2	2	----	1	---	1	1	---	----	3	2	2	2	1
	CO 4	1	2	2	1	1	--	--	1	3	3	3	2	2	1	3	1	1

School: SET		**Batch :2019**	
Program: B.Tech		**Current Academic Year:**	
Branch:cse		**Semester:VIII**	
1	Course Code	CSC021	Course Name B. Tech
2	Course Title	**Introduction to Block chain**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	13. Students will learn blockchain technologies via lectures and assignments. 14. Students will investigate various problem and regulation of blockchain through projects and assignments.	
6	Course Outcomes	Students will be able to: **CO1:**Understandingblockchain **CO2:**Analyze Cryptocurrency and its market place **CO3:**Application of blockchain and its regulations **CO4:**Analysis of blockchain	
7	Course Description	This course aims to introduce students to the fundamental concepts and techniques in blockchain, and giving students an overview of information security in blockchain.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Blockchain**	
	A	What is Blockchain, pillars of blockchain	CO1, CO3
	B	History of centralize services, trusted third party	CO1, CO3
	C	Immutability, Security, Privacy, Anti-fragility	CO1, CO3
	Unit 2	**Cryptocurrency and its markets**	
	A	Crypto currencies - Bitcoin / Ethereum	CO1, CO2, CO3
	B	Tokens and Transactions in blockchain, Distributed consensus	CO1, CO2, CO3
	C	Cryptography : hashing, data integrity, public –private key cryptography, bitcoin and block size	CO1, CO2, CO3
	Unit 3	**Type of blockchain and enterprises**	

	A	Public and private blockchain, side chains	CO2, CO3
	B	JP Morgan Quorum, IBM's stuff	CO2, CO3
	C	Use Cases – i. Digital Rights - ownership and accessibility, education **ii.** Industry - healthcare, identity, finance **iii.** Paradigm shift/future/big picture **iv.** Elections and Voting: Auto execution of contracts, escrow etc	CO2, CO3
	Unit 4	**Regulation and Anonymity**	
	A	ICO and SEC ruling, NY Bitlicense - and Post Obama Regulation	CO1, CO2
	B	Governments (not just US) regulating bitcoin, ETFs	CO4
	C	Anti Money Laundering, Political Implications on blockchain, Anonymity - Zcash, Monero	CO1, CO2,CO4
	Unit 5	**Problems with Blockchain**	
	A	Security and Safeguards , Protection from attackers	CO2
	B	Hacks on exchanges , Scalability problems	CO3
	C	Network attacks to destroy bitcoin , Case Study: Failed currencies & blockchains	CO4
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*		
	Other References	3. ISO/IEC 27001:2013	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:**introduction to blockchain	PO1,PO2,PO4,PO5, PO7.PSO1,PS04
2.	**CO2:**Analyze Cryptocurrency and its market place	PO1, PO3, PO4, PO9, PSO2
3.	**CO3:**Types of blockchain and its regulations	PO1,PO2,PO3,PO4,PO5, PO7.PSO1
4.	**CO4:**Understanding and analysis of blockchain	PO9, PO10, PSO3

PO and PSO mapping with level of strength for Course Name Introduction to Block Chain(Course Code CSC021)

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5

	CO 1	2	2	3	2	2	----	1	---	1	1	---	----	3	1	1	2	1
	CO 2	3	1	1	3	2	--	---	3	2	1	1	1	1	1	---	----	---
	CO 3	2	1	1	2	2	----	1	---	1	1	---	----	3	2	2	2	1
	CO 4	1	2	2	1	1	--	--	1	3	3	3	2	2	1	2	1	1

School: SET		**Batch :2019**	
Program: B.Tech		**Current Academic Year: 2019-19**	
Branch: CSE		**Semester: VIII**	
1	Course Code	CSC041	Course Name
2	Course Title	**Cloud Security**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	15. Provide students with an overview of the fundamental concepts of Cloud Computing. 16. Gain insight into the challenges and limitations Models of cloud computing. 17. To learn the various technologies of the cloud computing paradigm and learn about recent advances in Cloud Computing and enabling technologies. 18. Prepare students for research in the area ofcloud Computing risks and cloud security challenges. 19. Enhance students communication and problem solving skills	
6	Course Outcomes	Students will be able to: **CO1:** To understand the cloud computing Concepts. **CO2:**Explain how and why this paradigm came about and the influence of several enabling technologies physical and logical infrastructure **CO3:**cloud access control methods **CO4:**Understanding of Cloud monitoring , auditing and management	
7	Course Description	This course introduces advanced aspects of Cloud Computing, encompassing the principles, to analyze the cloud, identify the problems, and choose the relevant models and algorithms to apply.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction Cloud Computing**	
	A	Introduction to distributed systems, Defining Cloud Computing	CO1, CO2

	B	Understanding of Cloud Architecture: Composability, Infrastructure, Platform	CO1, CO2
	C	Virtual Appliances, Communication Protocols, Applications, Understanding Services: SaaS, PaaS, IaaS	CO1, CO2
	Unit 2	**Secure Isolation of Physical & Logical Infrastructure**	
	A	Isolation : Compute, Network and Storage	CO1, CO2,CO4
	B	Common attack vectors and threats, Secure Isolation Strategies o Multitenancy, Virtualization strategies	CO1, CO2,CO4
	C	Inter-tenant network segmentation strategies , Storage isolation strategies	CO1, CO2,CO4
	Unit 3	**Data Protection for Cloud Infrastructure and Services**	
	A	Understand the Cloud based Information Life Cycle , Data protection for Confidentiality and Integrity	CO1,CO2,CO3
	B	Common attack vectors and threats , Encryption, Data Redaction, Tokenization, Obfuscation, PKI and Key Management, Assuring data deletion	CO1,CO2,CO3
	C	Data retention, deletion and archiving procedures for tenant data , Data Protection Strategies	CO1,CO2,CO3
	Unit 4	**Enforcing Access Control for Cloud Infrastructure based Services**	
	A	Understand the access control requirements for Cloud infrastructure,	CO1,CO2,CO3
	B	Authentication and Authorization § Roles-based Access Control, Multi-factor authentication	CO1,CO2,CO3
	C	securing remote access, Verified and measured boot § Firewalls, IDS, IPS and honeypots	CO1,CO2,CO3
	Unit 5	**Monitoring, Auditing and Management**	
	A	Proactive activity monitoring, Incident Response , Monitoring for unauthorized access, malicious traffic, abuse of system privileges, intrusion detection, events and alerts	CO1,CO2,CO3
	B	Auditing – Record generation, Reporting and Management , Tamper-proofing audit logs	CO1,CO2,CO3
	C	Quality of Services , Secure Management o User management o Identity management o Security Information and Event Management	CO1,CO2,CO3
	Mode of examination	Theory	
	Weightage Distribution	CA	MTE
		30%	20%
	Text book/s* Other References	9. Barrie Sosinsky “*Cloud Computing (Bible)*”,Wiley 10. Anthony T.Velte, Toby J. Velte, Robert Elsenpeter”Cloud Computing: A Practical Approach” TATA McGRAW-HILL Edition. 11. Ronald L. Krutz and Russell Dean Vines, “Cloud Security: A	

		comprehensive Guide to Secure Cloud Computing", WILEY.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** To understand the cloud computing Concepts.	PO1,PO2,PO3,PO4,PSO1
2.	**CO2:**Explain how and why this paradigm came about and the influence of several enabling technologies physical and logical infrastructure	PO1, PO3, PO4, PSO2
3.	**CO3:**cloud access control methods	PO1,PO2,PO3,PO4
4.	**CO4:**Understanding of Cloud monitoring , auditing and management	PO9, PO10,PO11, PSO5

PO and PSO mapping with level of strength for Course Name Cloud Security (Course Code CSC041)

CSE	COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	CO 1	3	3	2	2	--	--	--	2	2	1	2	1	3	2	2	1	2
	CO 2	2	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
	CO 3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
	CO 4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	2

School: SET		**Batch :2019**	
Program: B.Tech		**Current Academic Year:**	
Branch: CSE		**Semester: VIII**	
1	Course Code	CSC051	Course Name B. Tech
2	Course Title	**Penetration Testing**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	20. Students will learn fundamentals of penetration testing via lectures and assignments. 21. Students will investigate various problem and regulation of penetration testing through projects and assignments.	
6	Course Outcomes	Students will be able to: **CO1:**Understanding Penetration Testing **CO2:**Legal and ethical consideration **CO3:** Understanding of Social Engineering Attacks **CO4:**Understanding and analysis of attacking the network and Performing Host Reconnaissance	
7	Course Description	This course aims to introduce students to the fundamental concepts and techniques in penetration testing, and giving students an overview of attack and securing methods	
8	Outline syllabus		CO Mapping
	Unit 1	**Understanding Penetration Testing**	
	A	Defining penetration testing, proliferation of Viruses and worm, Wireless LANs.	CO1, CO2, CO3
	B	Complexity of networks today, frequency of software updates, availability of hacking tools, the nature of open source	CO1, CO2, CO3
	C	Unmonitored mobile users and telecommuters, marketing demands, industry regulation, administrator trust, Hacktivism, Attack Stages	CO1, CO3
	Unit 2	**Legal and ethical consideration**	
	A	Ethics of penetration testing, Laws: US Law, Computer	CO1, CO4,

		Fraud and abuse act (CFAA), State Laws	CO3
	B	Regulatory Laws: Health Insurance Portability and Accountability Act (HIPAA), Graham-Leach-Bliley (GLB)	CO1, CO2, CO3
	C	Federal Information Security Management Act (FISMA), Sarbanes-Oxley Act (SOX)	CO1, CO2, CO3
	Unit 3	**Performing Social Engineering**	
	A	Human Psychology: conformity persuasion, logic persuasion, need-based persuasion, authority based persuasion, reciprocation based social engineering, similarity based social engineering, information based social engineering	CO2, CO3
	B	First Impressions and the social engineer, tech support impersonation, third-party impersonation	CO2, CO3
	C	E-Mail impersonation, end user impersonation, customer impersonation, Reverse Social engineering	CO2, CO3
	Unit 4	**Performing Host Reconnaissance**	
	A	Passive host reconnaissance, active host reconnaissance	CO1, CO2
	B	Port Scanning: TCP scan, SYN scan, NULL scan, FIN scan, ACK scan, Xmas-tree scan, Dump scan	CO4
	C	NMap, Detecting a Scan: intrusion detection, Anomaly Detection system, misuse detection system,	CO1, CO2,CO4
	Unit 5	**Attacking the Network**	
	A	Bypassing Firewall, Evading Intruder Detection Systems, Testing Routers for Vulnerabilities: CDP, HTTP service, Password Cracking, Modifying Routing Tables	CO2,CO4
	B	Testing Switches for Vulnerability: VLAN Hopping, Spanning Tree Attacks, MAC Table Flooding, ARP Attacks, VTP Attacks	CO3,CO4
	C	Securing the Network; Securing Firewalls, Securing Routers, Securing Switches. Case Study	CO4,CO3
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	Penetration Testing and Network Defence, Andrew Whitaker, Daniel P. Newman	
	Other References	4. ISO/IEC 27001:2013	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:**Understanding Penetration Testing	PO1,PO2,PO3,PO4,PO5, PO7.PSO1,PS04,PS05
2.	**CO2:**Legal and ethical consideration	PO1, PO3, PO5,PO8,

		PO9, PSO2
3.	**CO3:** Understanding of Social Engineering Attacks	PO1,PO2,PO3,PO4,PO5, PO6,PO7,PSO1,PS04
4.	**CO4:**Understanding and analysis of attacking the network and Performing Host Reconnaissance	PO9, PO10,PO11, PSO3

PO and PSO mapping with level of strength for Course Name Penetration Testing (Course Code CSC051)

CSE	Cos	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
	CO 1	2	2	1	2	2	----	1	---	1	1	---	----	3	1	1	2	1
	CO 2	3	1	1	2	2	--	---	3	2	1	1	1	1	1	---	----	---
	CO 3	2	1	3	2	2	----	1	---	1	1	---	----	3	2	2	2	1
	CO 4	1	2	2	1	1	--	--	1	3	3	3	2	2	1	3	1	1

School: SET		**Batch :2019**		
Program: B.Tech		**Current Academic Year:**		
Branch:CSE		**Semester: VIII**		
1	Course Code	CSC061	Course Name B. Tech	
2	Course Title	**Disaster Recovery Management**		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	Elective		
5	Course Objective	22. Students will learn fundamentals of Disaster Recovery via lectures and assignments. 23. Students will investigate various problem and regulation of BCM through projects and assignments.		
6	Course Outcomes	Students will be able to: **CO1:**Understanding to Disaster and risk reduction **CO2:**Understanding of Disaster management cycle **CO3:** Knowledge of Business continuity Management **CO4:** Application of BCM development process		
7	Course Description	This course aims to introduce students to the fundamental concepts and techniques in disaster recovery and business continuity management.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction to Disaster**		
	A	Concepts of Hazard, Vulnerability, Risks, Natural Disasters (earthquake, Cyclone, Floods, Volcanoes), and Man Made Disaster (Armed conflicts and civil strip, Technological disasters, Human Settlement, Slow Disasters (famine, draught, epidemics) and Rapid Onset Disasters(Air Crash, tidal waves, Tsunami) Risks		CO1, CO2
	B	Difference between Accidents and Disasters, Simple and Complex Disasters, Refugeeproblems, Political, Social, Economic impacts of Disasters, Gender and Social issuesduring disasters, principles of psychosocial issues		CO1, CO2

		and recovery during emergencysituations, Equity issues in disasters	
	C	Relationship between Disasters and Development and vulnerabilities, different stake holders in Disaster Relief. Refugee operations during disasters, Human Resettlement and Rehabilitation issues during and after disasters, Inter-sectoral coordination during disasters, Models in Disasters	CO1, CO2
	Unit 2	**APPROACHES TO DISASTER RISK REDUCTION**	
	A	Disaster Risk Reduction Strategies, Disaster Cycle, Phases of Disaster, Preparedness Plans, Action Plans and Procedures, Early warning Systems Models in disaster preparedness, Components of Disaster Relief-(Water, food, sanitation, shelter, Health and Waste Management), Community based DRR, Structural non structural measures in DRR	CO1, CO2, CO3
	B	Factors affecting Vulnerabilities, , Main streaming disaster risk reduction in development, Undertaking risk and vulnerability assessments, Policies for Disaster Preparedness Programs, Preparedness Planning, Roles and Responsibilities, Public Awareness and Warnings, Conducting a participatory capacity and vulnerability analysis	CO1, CO2, CO3
	C	Sustainable Management, Survey of Activities Before Disasters Strike, Survey of Activities During Disasters, DRR Master Planning for the Future, Capacity Building, Sphere Standards. Rehabilitation measures and long term reconstruction. Psychosocial care provision during the different phases of disaster	CO1, CO2, CO3
	Unit 3	**Disaster Management Cycle and Framework**	
	A	Disaster Management Cycle – Paradigm Shift in Disaster Management Pre-Disaster – Risk Assessment and Analysis, Risk Mapping, zonation and Microzonation, Prevention and Mitigation of Disasters, Early Warning System; Preparedness, Capacity Development	CO2, CO3
	B	Awareness During Disaster – Evacuation – Disaster Communication – Search and Rescue – Emergency Operation Centre – Incident Command System – Relief and Rehabilitation – Post-disaster – Damage and Needs Assessment	CO2, CO3
	C	Restoration of Critical Infrastructure – Early Recovery – Reconstruction and Redevelopment; IDNDR, Yokohama Strategy , Hyogo Framework of Action	CO2, CO3
	Unit 4	**Business Continuity Management**	
	A	Introduction , Definition and Scope of Business	CO1, CO2, CO3
	B	Business Continuity Management (BCM), Drivers of	CO3, CO4

		Business continuity management			
	C	Roles and Responsibility of BCM			CO1, CO2, CO3
	Unit 5	**Development of BCM**			
	A	Developing effective BCM Capabilities			CO1, CO4
	B	Software application that support BCM			CO4
	C	BCM in Action: Example of "Good" Practices			CO4
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Business Continuity Management by Eric Krell			
	Other References	5. ISO/IEC 27001:2013			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:**introduction to Disaster and risk reduction	PO1,PO2,PO3,PO4,PO5, PO7.PSO1,PS04
2.	**CO2:**Get knowledge of Disaster management cycle	PO1, PO3, PO4,PO8, PO9, PSO2
3.	**CO3:** Knowledge of Business continuity Management	PO1,PO2,PO3,PO4,PO5, PO7.PSO1,PS04
4.	**CO4:** BCM development process	PO9, PO10,PO11, PSO3

PO and PSO mapping with level of strength for Course Name Disaster Recovery & Business Continuity Management (Course Code CSC061)

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	2	3	2	2	----	1	---	1	1	---	----	3	1	1	2	1
	CO2	3	1	1	3	2	--	---	3	2	1	1	1	1	1	---	----	---
	CO3	2	1	3	2	2	----	1	---	1	1	---	----	3	2	2	2	1
	CO4	1	2	2	1	1	--	--	1	3	3	3	2	2	1	3	1	1

School:SET		**Batch :2019**		
Program: B.TECH		**Current Academic Year:**		
Branch:CSE		**Semester:VIII**		
1	Course Code	CSC062	Course Name B. Tech	
2	Course Title	**Risk Management**		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	Elective		
5	Course Objective	1. Students will learn fundamentals of risk management via lectures and assignments. 2. Students will investigate various problem and regulation of risk management through projects and assignments.		
6	Course Outcomes	Students will be able to: **CO1:** Understand basic concept of risk management **CO2:**Analyze Risk Management tools and techniques **CO3:**Explorefundamentals of information assurance **CO4:**Understanding and analysis of risk management issues and risk governance		
7	Course Description	This course aims to introduce students to the fundamental concepts and techniques in risk management, and giving students an overview of risk management in security perspective.		
8	Outline syllabus			CO Mapping
	Unit 1	**Fundamentals of Risk Management**		
	A	Definition, quantitative and Qualitative risk management		CO1, CO3
	B	basics of risk and decision theory : elements of probability theory ,value function , utility function		CO1, CO3
	C	enterprise risk , capability and operability risk ,extreme event analysis, Risk Management Process		CO1, CO3
	Unit 2	**RM Tools and Techniques**		

	A	Preliminary Hazard Analysis (PHA) ,Hazard and Operability Analysis (HAZOP)		CO1, CO2, CO3
	B	Failure Mode and Effects Analysis (FMEA) , Fault Tree Analysis (FTA)		CO1, CO2, CO3
	C	Cause and Consequences Analysis (CCA) ,The principle of As Low As Reasonably Practicable (ALARP)		CO1, CO2, CO3
	Unit 3	**Information Assurance**		
	A	Introduction to Information Assurance		CO2, CO3
	B	Information Security and Risk Management Practices, Network Security and Telecommunications		CO2, CO3
	C	Systems Development, Application Development, and Access Control		CO2, CO3
	Unit 4	**Information Assurance and Risk Management Issues**		
	A	Information Assurance and Risk Management Issues: Cloud Computing		CO1, CO2
	B	Information Assurance and Risk Management Issues: Social Networking		CO4
	C	Information Assurance and Risk Management Issues: Mobile Technologies		CO1, CO2,CO4
	Unit 5	**Cyber Risk Governance**		
	A	Risk Governance ,Complexity of cyber risk management: Legal, Political, Technical, Economic and Social		CO2
	B	Introduction to economics and risk management ,Economic barriers to cyber system risk management		CO3
	C	Economic interventions to risk management		CO4
	Mode of examination	Theory		
	Weightage Distribution	CA / 30%	MTE / 20%	ETE / 50%
	Text book/s*			
	Other References	6. ISO/IEC 27001:2013		

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:**introduction to risk management	PO1,PO2,PO5, PO7.PSO1,PS04
2.	**CO2:** Risk Management tools and techniques	PO1, PO3, PO4,PO8, PO9
3.	**CO3:**fundamentals of information assurance	PO1,PO3,PO4,PO5, PO7.PSO1,PS04
4.	**CO4:**Understanding and analysis of risk management issues and risk governance	PO9, PO10,PO11, PSO3

PO and PSO mapping with level of strength for Course Name Risk Management (Course Code CSC062)

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	2	2	3	2	2	----	1	---	1	1	---	----	3	1	1	2	1
	CO2	2	1	1	3	-	--	---	3	2	1	1	1	1	1	---	----	---
	CO3	2	1	2	2	2	----	1	---	1	1	---	----	3	2	2	2	1
	CO4	1	2	2	1	1	--	--	1	3	3	3	2	2	1	2	1	1

SPECILIZATION	**TERM**	**Course Code**	**Course**	**Credits**
Data Science	II	CSD102	Introduction To Data Science	2
	III	CSD201	Data Collection and Preprocessing	4
	IV	CSD202	Data Warehouse	3
	V	CSD301	Data Mining	3
	VI	CSD302	Big data Analytics	4
	VII	CSD401	Business Intelligence	4
	PE1	CSD011		3
	PE2	CSD021	Business Process Management	3
	PE3	CSD031	Social Media Analytics	3
	PE3	CSD032	Business for Data driven Companies	3
	PE4	CSD041	Introduction to deep Learning	3
	PE5	CSD051	Web & Text Analysis	3
	PE5	CSD052	Data Exploration and Visualization	3
	PE6	CSD061	Predictive Analytics	3

SHARDA UNIVERSITY
Beyond Boundaries

School: SET		**Batch : 2019-22**	
Program: B.TECH		**Current Academic Year: 2019**	
Branch: CSE		**Semester: V**	
1	Course Code	CSD202	Course Name
2	Course Title	**Data Warehouse**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status		
5	Course Objective	3. Provide students with an overview of the methodologies and approaches to data warehouse 4. Gain insight into the challenges and limitations of different data warehouse architecture 5. Provide the students with practice on data modeling	
6	Course Outcomes	Students will be able to: **CO1:** Understand concept warehousing **CO2:** Identify the architecture suitable for implementation **CO3:** Apply the modeling techniques **CO4:** Integrating and interpreting the data sets and improving effectiveness, efficiency and quality for data analysis.	
7	Course Description	This course introduces advanced aspects of data warehousing encompassing the principles, to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Data Warehousing**	
	A	The Need for Data Warehousing; Increasing Demand for Strategic Information,	CO1
	B	Inability of Past Decision Support System, Operational V/s Decisional Support System,	CO1
	C	Role of Metadata, Classification of Metadata	CO1
	Unit 2	**Data Warehouse Architecture**	
	A	Data warehouse lifecycle, Top down vs Bottom Up approach, Data Warehouse vs Data Marts, OLAP vs OLTP	CO2
	B	Different Types of Architecture, Centralized data warehouse, Independent data marts, Federated , Hub and spoke, Data Mart Bus	CO2
	C	Data Extraction , Transformation and Loading	CO2
	Unit 3	**Data Warehouse modeling:**	
	A	Introduction to data cube,drill down , roll up , slice and	CO3

		dice	
	B	ER vs Dimensional Modeling, Dimension Modelling: star Schema	CO3
	C	Snowflake and fact constellation schema, fact less tables.	CO3
	Unit 4	**Dimensional Modeling Advance topics**	
	A	Slowly changing dimensions : type1, Type 2 , Type3 changes, Junk dimensions , large dimensions	
	B	Modeling: Descriptive attributes, cross dimensional attributes, convergence, shared hierarchies, incomplete hierarchies, recursive hierarchies	CO3
	C	Aggregation-additive, non-additive, convergence,	CO3
	Unit 5	**Index for data warehouse**	
	A	B+ tree index, Bitmap index, Projection Index	CO4
	B	Join and Star index, spatial index	CO4
	C	Optimizers, index dimension table, physical design elements	CO4
	Mode of examination	Theory	
	Weightage Distribution	CA 30%	MTE 20%	ETE 50%	
	Text book/s*	12. M. Golfarelli , S. Rizzi Data warehouse design Modern Principles and methodologies, Tata Macgraw Hills 13. P. Ponniah Data Warehousing Fundamentals for IT professionals, Willey	
	Other References	11. J.Han,M. Kamber, J. Pei *"Data Mining Concepts and Techniques"*,Edition:3 , Morgan Kaufmann	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** To understand concept warehousing	PO1,PO2,PO3,PO4,PSO1
2.	**CO2::** To identify the architecture suitable for implementation.	PO1, PO3, PO4, PSO2
3.	**CO3:** To apply the modeling techniques	PO1,PO2,PO3,PO4
4.	**CO4:** To integrating and interpreting the data sets and improving effectiveness, efficiency and quality for data analysis.	PO9, PO10,PO11, PSO5

PO and PSO mapping with level of strength for Course Name Data Warehouse (Course Code CSD202)

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
	CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
	CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
	CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

School: SET	**Batch : 2019-22**		
Program: B.Tech	**Current Academic Year: 2019-2019**		
Branch: CSE	**Semester:VI**		
1	Course Code	CSD301	Course Name
2	Course Title	**Data Mining**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Core	
5	Course Objective	6. Provide students with an overview of the methodologies and approaches to data mining 7. Gain insight into the challenges and limitations of different data mining techniques 8. Provide the students with practice on applying data mining solutions 9. Prepare students for research in the area of data mining and related applications	
6	Course Outcomes	Students will be able: **CO1:** To understand and implement classical algorithms in data mining **CO2:** To integrating and interpreting the data sets and improving effectiveness, efficiency and quality for data analysis. **CO3:** To identify the application area of algorithms, and apply them. **CO4:** To assess the strengths and weaknesses of the algorithms	
7	Course Description	This course introduces advanced aspects of data warehousing and data mining, encompassing the principles, to analyze the data, identify the problems, and choose the relevant models and algorithms to apply.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Data Mining**	
	A	Evolution of Data mining and introductory concepts, Knowledge Discovery Process,	CO1
	B	Central Tendency, Box Plots, introduction to Data Mining Techniques.	CO1
	C	Introduction to outlier	CO1
	Unit 2	**Data Preprocessing**	
	A	Descriptive Data Summarization, Data Cleaning	CO2
	B	Integration and Transformation,	CO2
	C	Data Reduction, Discretization and Concept Hierarchy Generation.	CO2
	Unit 3	**Frequent Pattern Mining**	
	A	Efficient and Scalable Frequent Itemset Mining Methods: Aprori	CO3
	B	FPGrowth, ECLATS	CO3
	C	correlation Analysis.	CO4

	Unit 4	**Classification& Prediction**			
	A	What is classification, requirements of classification, Decision Tree-ID3Algorithm, ,			CO3
	B	Naive Bayes Classifier, Rule Based classification, Backpropogation			CO3
	C	Support Vector Machine for linearly separable data. Prediction: - Linear Regression, Model Evaluation Techniques			CO3, CO4
	Unit 5	**Clustering**			
	A	What is cluster analysis, requirements of cluster analysis,			CO3
	B	Partitioning methods-k-means and k-mediods,			CO3
	C	Hierarchical Methods-Agglomerative and divisive, Density based methods- DBSCAN			CO3,CO4
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	14. J.Han,M. Kamber, J. Pei *"Data Mining Concepts and Techniques"*,Edition:3 , Morgan Kaufmann			
	Other References	12. M.H. Dunham, *Data Mining Introductory and Advanced Topics*, Pearson Education. 13. Adriaans, *Data Mining*, Pearson Education 14. VikramPudi& P. Radhakrishnan, "Data Mining", Oxford University Press			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** To understand and implement classical algorithms in data mining and data warehousing.	PO1,PO2,PO3,PO4,PSO1
2.	**CO2:** To assess the strengths and weaknesses of the algorithms.	PO1, PO3, PO4, PSO2
3.	**CO3:** To identify the application area of algorithms, and apply them.	PO1,PO2,PO3,PO4
4.	**CO4:** To integrating and interpreting the data sets and improving effectiveness, efficiency and quality for data analysis.	PO9, PO10,PO11, PSO5

PO and PSO mapping with level of strength for Course Name Data Mining (Course Code CSD301)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
	CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
	CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
	CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

School: SET		**Batch : 2019-22**	
Program: B.Tech		**Current Academic Year: 2019**	
Branch:CSE		**Semester:VIII**	
1	Course Code	CSD302	Course Name
2	Course Title	**Big data Analytics**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-0-2	
	Course Status	Core	
5	Course Objective	Understand the Big Data Platform and its Use cases • Provide an overview of Apache Hadoop • Provide HDFS Concepts and Interfacing with HDFS • Understand Map Reduce Jobs • Provide hands on Hadoop Eco System • Apply analytics on Structured, Unstructured Data. • Exposure to Data Analytics with	
6	Course Outcomes	The students will be able to: • Identify Big Data and its Business Implications. • List the components of Hadoop and Hadoop Eco-System • Access and Process Data on Distributed File System • Manage Job Execution in Hadoop Environment • Develop Big Data Solutions using Hadoop Eco System	
7	Course Description	The Big Data Applications & Analytics course is an overview course in Data Science and covers the applications and technologies Hadoop, hive , pig.	
8	Outline syllabus		CO Mapping
	Unit 1	**INTRODUCTION TO BIG DATA AND HADOOP**	
	A	Types of Digital Data, Introduction to Big Data, Big Data Analytics, History of Hadoop, Apache Hadoop	CO1, CO2
	B	Analysing Data with Unix tools, Analysing Data with Hadoop, Hadoop Streaming,	CO1, CO2
	C	Hadoop Echo System, IBM Big Data Strategy, Introduction to Infosphere BigInsights and Big Sheets.	CO1, CO2
	Unit 2	**HDFS(Hadoop Distributed File System)**	
	A	The Design of HDFS, HDFS Concepts, Command Line Interface	CO1, CO2,CO4
	B	Hadoop file system interfaces, Data flow, Data Ingest with Flume and Scoop and Hadoop archives,	CO1, CO2,CO4
	C	Hadoop I/O: Compression, Serialization, Avro and File-Based Data structures..	CO1, CO2,CO4
	Unit 3	**Map Reduce**	
	A	Anatomy of a Map Reduce Job Run, Failures, Job Scheduling	CO1,CO2,CO3
	B	Shuffle and Sort, Task Execution,	CO1,CO2,CO3

	C	Map Reduce Types and Formats, Map Reduce Features.			CO4
	Unit 4	**Hadoop Eco System**			
	A	**Pig** : Introduction to PIG, Execution Modes of Pig, Comparison of Pig with Databases, Grunt, Pig Latin, User Defined Functions, Data Processing operators.			CO1,CO2,CO3
	B	**Hive**: Hive Shell, Hive Services, Hive Metastore, Comparison with Traditional Databases, HiveQL, Tables, Querying Data and User Defined Functions.			CO1,CO2,CO3
	C	**Hbase :** HBasics, Concepts, Clients, Example, Hbase Versus RDBMS. Big SQL : Introduction			CO1,CO2,CO3
	Unit 5	**Data Analytics with R:**			
	A	Introduction, Supervised Learning, Unsupervised Learning,			CO1,CO2,CO3
	B	Collaborative Filtering			CO1,CO2,CO3
	C	Big Data Analytics with BigR.			CO1,CO2,CO3
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Tom White " Hadoop: The Definitive Guide" Third Edit on, O'reily Media, 2012. 2. Seema Acharya, Subhasini Chellappan, "Big Data Analytics" Wiley 2015			
	Other References	1. Michael Berthold, David J. Hand, "Intelligent Data Analysis", Springer, 2007. 2. Jay Liebowitz, "Big Data and Business Analytics" Auerbach Publications, CRC press (2013) 3. Tom Plunkett, Mark Hornick, "Using R to Unlock the Value of Big Data: Big Data Analytics with Oracle R Enterprise and Oracle R Connector for Hadoop", McGraw-Hill/Osborne Media (2013), Oracle press. 4. Anand Rajaraman and Jef rey David Ulman, "Mining of Massive Datasets", Cambridge University Press, 2012.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1** Identify Big Data and its Business Implications.	PO1,PO2,PO3,PO4,PSO1
2.	**CO2:** List the components of Hadoop and Hadoop Eco-System	PO1, PO3, PO4, PSO2
3.	**CO3:** Access and Process Data on Distributed File System	PO2,PO3,PO4,PSO3
4.	**CO4:** Manage Job Execution in Hadoop Environment	PO7, PO10,PO11, PSO5
5	**CO5:** Develop Big Data Solutions using Hadoop Eco System	PO4,PO8

PO and PSO mapping with level of strength for Course Name Big data Analytics (Course Code CSD302)

CSE	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
	CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
	CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
	CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3
	CO5	3	2	3	3	1	-	1	3	2	2	2	2	2	2	2	1	1

School: SET		**Batch : 2019-22**	
Program: B.TECH		**Current Academic Year: 2019**	
Branch:CSE		**Semester:7**	
1	Course Code	CSD401	Course Name:
2	Course Title	**Business Intelligence**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-0-2	
	Course Status	UG	
5	Course Objective	1 .Provide students with an overview of the methodologies and approaches to Business Intelligence. 2.It focuses on dashboards design by utilizing key performance indicators that managers can use to improve day-to-day business operations 3.Provide students to plan and implement BI development projects 4. Prepare student to know the administrative and deployment scenarios & issues in BI space.	
6	Course Outcomes	Students will be able to: **CO1:**Design and develop dashboards	

		CO2: Learn the best practices to work on BI projects. **CO3:** Use tools to develop, implement and administrate wide range of BI artifacts **CO4:** Apply various modeling techniques and Apply business intelligence methods to various situations	
7	Course Description	This course Have an overall understanding of the major issues and applications in business intelligence including a basic grasp of the algorithm classes and best practices for building successful BI projects.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Business Intelligence:**	
	A	Business Intelligence (BI), Scope of BI solutions and their fitting into existing infrastructure, BI Components and architecture, BI Components, Future of Business Intelligence, SaaS and Cloud computing techniques	CO2,CO3
	B	Functional areas of BI tools, End user assumptions, Setting up data for BI, Data warehouse, OLAP and advanced analytics,	CO2,CO3
	C	Supporting the requirements of senior executives including performance management, Glossary of terms and their definitions specific to the field of BI and BI systems.	CO2,CO3
	Unit 2	**Elements of Business Intelligence Solutions:**	
	A	Business Query and Reporting, Dashboard design principles, Dashboards and Scorecards Development,	CO1,CO2
	B	Role of Metadata, challenges of Metadata ,Automated Tasks and Events	CO1,CO2
	C	Mobile Business Intelligence, Software development kit (SDK).	CO1,CO2
	Unit 3	**Building BI Project:**	
	A	Stages of Business Intelligence Projects, Gartner Maturity Model, ASUG business intelligence maturity model	CO3,CO4
	B	Risk Management and Mitigation, Cost justifying BI solutions	CO3,CO4
	C	measuring success. BI Design and Development.	CO3,CO4
	Unit 4	**Reporting** :	
	A	Metadata Layer, Presentation Layer, Data Layer, Use of different layers and overall Reporting architecture,	CO2,CO3
	B	Basic Report authoring, Various report elements such as Charts, Tables, prompts, Data aggregation	CO2,CO3
	C	Table based, Materialized views, OLAP, Ad-hoc reports, interactivity in analysis (drill down, drill up).	CO2,CO3
	Unit 5	**Time series:**	
	A	Definition of time series **,**Index numbers, Evaluating time series model	CO4,CO2
	B	Distortion measures, Dispersion measures **,**Tracking signal, Analysis of the components of time series	CO4,CO2

	C	Moving average, Decomposition of a time series			CO4,CO2
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1.Jerzy Surma,2011, *Business Intelligence: Making Decisions through Data Analytics*, New York, N.Y., Business Expert Press			
	Other References	1. Carlo Vercellis,*Business Intelligence: Data Mining and Optimizationfor Decision Making*, A John Wiley and Sons, Ltd., Publication 2. Ralph Kimball, Margy Ross, *"The complete Guide to dimensional modeling* Latest edition, Publisher: Wiley publication ISBN- 0-471-20024-7 3. Ralph Kimball, Joe Caserta," *"The data warehouse ETL toolkit: practical techniques for extracting, cleaning, conforming, and delivering data""*, Publisher: Wiley. ISBN: 0-7645-6757-8			

<u>CO and PO Mapping</u>

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:**Design and develop dashboards	PO1,PO3,PO4,PO5,PO9,PO11,PO12
2.	**CO2:**Learn the best practices to work on BI projects.	PO1, PO3, PO4,PO9,PO12
3.	**CO3:**Use tools to develop, implement and administrate wide range of BI artifacts	PO1,PO2,PO3,PO4,PO5,PO9,PO11,PO12
4.	**CO4:**Apply various modeling techniques and Apply business intelligence methods to various situations	PO1, PO2,PO3, PO5,PO9,PO10,PO11,PO12

PO and PSO mapping with level of strength for Course Name Business Intelligence (Course Code CSD401)

CSE	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	3	-	3	3	3	-	-	-	3	-	3	3	3	-	3	1	3
	CO2	2	-	2	2	-	-	-	-	3	-	-	3	2	-	1	1	-
	CO3	3	3	3	1	3	-	-	-	3	3	3	3	3	3	3	1	3

	CO4	3	3	2	-	3	-	-	-	2	2	2	2	3	3	2	1	2

School: SET		**Batch : 2019**	
Program: B.Tech		**Current Academic Year: 2019-19**	
Branch: CSE		**Semester: VI**	
1	Course Code	CSD021	Course Name: Business Process Management
2	Course Title	Business Process Management	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	UG	
5	Course Objective	Business Process Management course focuses on the essential skills business people require to analyze and redesign their processes.	
6	Course Outcomes	After the successful completion of this course, students will be able to: **CO1:**Understand Process Designer and its objectives CO2: Understand Process Modeling and its relation to BPM CO3:Perform translation of workflow steps into business process activities CO4:Design complex process applications CO5: Create dashboards and reports	
7	Course Description	Business Process Management (BPM) is a management discipline concerned with lifting an organization's performance through improvement, management and control of business processes. It encapsulates methods, techniques and software involved throughout all stages of the process lifecycle including analysis, design, enactment and control.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to BPM**	
	A	Business Process, Business Process Management, Themes of Business Process, Goals of Business Process, Principles of Business Process,Process Choreographies and its importance, Process Designer, Administration and stakeholders of business process, Classification of Business Processes, Organizational versus Operational .	CO1
	B	Intraorganizational Processes versus Process, Degree of Automation, Degree of Repetition, Degree of Structuring, Goals: Structure, and Organization, Business Process Modelling Foundation, Conceptual Model and Terminology, Abstraction Concepts, Horizontal Abstraction, Vertical Abstraction From Business Functions to Business Processes Business Analysis: Business Process Analysis, Object Oriented Analysis, Structure Analysis	CO1,CO2, CO4

	C	Process Models and Process instances, Process Models, Activity Models and Gateway Models, Activity Instances. Business Process Modeling Notations.	CO1,CO2,CO3
	Unit 2	BPM Life Cycle Methodology	
	A	Business Process Management Activities: Modelling, Execution, Monitoring, Optimization, Components of BPM suites, BPM Technology Workflow, Managing end-to-end, Customer-facing Processes	CO2,CO3
	B	Business Process Management Life Cycle , Programming Language for BPM, Establishing a common language for business-IT alignment, Cloud Computing BPM, Market, Benefits	CO1,CO2,CO3
	C	Interaction between Business Process and Data, Business Process Management tools and simulation, Business Process Integration and reengineering	CO2
	Unit 3	Business Process Management Overview	
	A	Overview of Business Process Management and Process Modelling, Process Designer, Overview of Business Process Management and Process Modelling,, Artifacts in Business Process Designing, Process development with the Process Centre, Process applications: Overview, Process applications and business level applications.	CO3,CO4
	B	Various Notation used to create BPD, Creating BPD	CO3, CO4
	C	Building Services, Understanding service components, Business objects and variable, Modelling events, Business objects and variables, Modelling events, Modelling event gateways, Creating user interfaces, Designing process interactions for business users, Enabling processes for tracking and reporting, Running and debugging processes with the Inspector	CO3,CO4
	Unit 4	Creating User Interfaces	
	A	Creating user interfaces, Coaches - Difference between Coaches and Heritage Coaches. Developing reusable Coach Views - Coach Views, Templates, Stock controls - Button, Checkbox, Date Time Picker, Horizontal Section, Output Text, Select, Table Tabs, Text, Vertical Section. Stock content controls, Document List - Document Viewer. Advanced items for Coach Views - Content box, Custom HTML	CO1,CO3,CO4
	B	Boundary events. Binding views with data - Defining Coach View behavior. Architecting complex process applications - Designing process interactions for business users, Configuring a role-based business user interface. Developing flexible and efficient process applications, Integrating with other systems, Creating outbound integrations, Integration Service implementations, Web Service Integration step in an integration service.	CO1,CO3,CO4

	C	Business Process Manager SQL Integration services. Understanding the message structure, Passing complex variable types to Undercover Agents, Passing IBM BPM Structured types, Passing Record type, Passing Date/Time types, Passing Boolean type, Passing Map type etc.			CO1,CO3,CO4
	Unit 5	**Inferential Statistics and Prescriptive analytics**			
	A	Solution for Collaborative Lifecycle Management, Info Sphere Data Architect, WebSphere Operational Decision Management, and Business Process Manager Advanced, Integration. Designing process interactions for business users			CO4,CO5
	B	BPEL process interactions,Factors affecting BPEL process interactions, Defining reports in process Designer, Developing flexible and efficient process applications - Enabling processes for tracking and reporting.			CO4,CO5
	C	Case study on various Business Process Management tools i.e. IBM BPM			CO2,CO4,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	12. **Business Process Management** (IBM ICE Publication) 13. **Business ProcessManagementConcepts, Languages, Architectures, MathiasWeske, Springer** 14. **Deliver Modern UI for IBM BPM with the Coach Framework and Other Approaches(E-Book)**			
	Other References	6. Internet as a resource for reference			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1:Understand Process Designer and its objectives	PO1,PO3,PO6,PO8, PSO3
2.	CO2:Understand Process Modeling and its relation to BPM	PO1,PO2,PO3, PSO3, PSO4
3.	CO3:Translation of workflow steps into business process activities	PO4,PO6, PO7,PO9,PSO3, PSO4
4.	CO4:Architect complex process applications	PO1,PO3,PO4,PO5, PSO3 PSO4
5.	CO5: Visibility through dashboards and reports	PO1,PO3,PO4,PO5, PSO3PSO4

PO and PSO mapping with level of strength for Course Name Business Process Management CSD021

CSE	Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
	CO1	1	1	1	1	1	1	1	1	-	-	1	1	-	-	3	1	3
	CO2	2	2	2	2	1	1	1	1	1	2	1	2	1	1	3	1	3
	CO3	3	2	3	3	3	2	1	2	3	3	1	3	1	3	3	3	3
	CO4	3	2	3	3	3	2	1	2	3	3	1	3	1	3	3	3	3
	CO5	1	2	2	2	2	2	1	2	1	2	1	2	-	2	3	1	3

School: SET		**Batch : 2019**	
Program: B.Tech		**Current Academic Year: 2019-19**	
Branch: CS		**Semester: VI**	
1	Course Code	CSD031 Course Name:	
2	Course Title	Social Media Analytics	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	UG	
5	Course Objective	The course will cover techniques developed by the computer science research community for analyzing social networks and social media datasets.	
6	Course Outcomes	After the successful completion of this course, students will be able to : • To understand the fundamentals of Social media and related concepts. • Perform analysis on Social media data. • Analyze the structure and evolution of networks • Identify and successfully apply appropriate techniques and tools to solve actual Big Data problems	
7	Course Description	Social Media Analytics is the science of analyzing data to convert information to useful knowledge. This knowledge could help us understand our world better, and in many contexts enable us to make better decisions.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction to Social Media Analytics Platform, Types of Social Media Analytics Challenges of conventional systems, Social Media Analytics Life Cycle	CO1
	B	Types of Social Media Analytics, How analytics used in practice	CO1,CO2
	C	Analytic processes and tools, Data Identification, Data Analysis, Information interpretation, Modern data analytic tools: Marketing, Impact on business intelligence	CO1,CO2
	Unit 2	**Phenomenology of social media**	
	A	3 Key Social Media Monitoring Tasks:Diagnose, Prioritize, Evaluate	CO1,CO2,CO3
	B	Types of Social Media Monitoring Metrics: Conversion, Reach, Impression, Engagement, Audience growth Rate, Visits vs unique visits, BounceRate, Referral traffic, influence Score	CO1,CO2,CO3

	C	Social Network Analytics Dashboards	CO1,CO2,CO3
	Unit 3	**social media monitoring**	
	A	social media monitoring: Using social media dashboards on the platforms	CO2,CO4
	B	social media monitoring: Using Third party Social Media Analytics tools	CO2,CO4
	C	Facebook insight, Twitter Analyst, Linkden, Google Analytics, Buffer	CO2,CO4
	Unit 4	**SOCIAL NETWORK Analysis**	
	A	Clustering of Social Network graphs: Between's, Girvan Newman algorithm- -	CO1,CO3
	B	Discovery of communities- Cliques and Bipartite graphs	CO1,CO3
	C	Graph partitioning methods-Matrices-Eigen valuesSimrank	CO1,CO3
	Unit 5	**Reporting and Software Integration**	
	A	social media analytics tool for reporting	CO2,CO4
	B	Social Media Analytics & Software Integrations	CO2
	C	How to Choose a Social Media Analytics Tool,Industry challenges and application of analytics	CO2
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1. Social Media Mining: An Introduction Zafarani et al. 2014	
	Other References	1. Wasserman, S., & Faust, K, "Social Network Analysis: Methods and Applications", Cambridge University Press; 1 edition, 1994. 2. Internet As Source 3. https://blog.loginradius.com/2015/07/social-media-analytics/	

<u>CO and PO Mapping</u>

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1: To understand the fundamentals of Social media and related concepts.	PO1,PO3,PO6,PO8, PSO3
2.	CO2: Social media data extraction and analysis.	PO1,PO2,PO3, PSO3, PSO4
3.	CO3Analyze the structure and evolution of networks	PO4,PO6, PO7,PO9,PSO3, PSO4
4.	CO4: Identify and successfully apply appropriate techniques and tools to solve actual Big Data problems	PO1,PO3,PO4,PO5, PSO3 PSO4

SPECILIZATION	TERM	Course Code	Course	Credits
Internet of Things & Applications	II	CSI102	Introduction To IOT	2
	III	CSI201	Embedded System	4
	IV	CSI202	IoT: Sensing & Actuator Devices	3
	V	CSI301	IoT: Architecture & Protocols	3
	VI	CSI302	IoT Applications	4
	VII	CSI401	IoT Security	4
	PE1	CSI011	Android with IOT	3
	PE2	CSI021	Wireless Sensor Networks	3
	PE3	CSI031	Image Processing with IOT	3
	PE4	CSI041	IOT in Big data analytics	3
	PE4	CSI042	IOT in ML	3
	PE5	CSI051	IOT in Healthcare	3
	PE5	CSI052	Fog Computing in IoT	3
	PE6	CSI061	Industrial IoT 4.0	3

School: SET		Batch : 2019-22	
Program: BTECH		**Current Academic Year: 2019-2019**	
Branch: CSE		**Semester:V**	
1	Course Code	CSI021	
2	Course Title	Wireless Sensor Networks	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-2	
	Course Status	UG	
5	Course Objective	1. knowledge of mobile ad hoc networks, design and implementation issues, and available solutions. 2. knowledge of routing mechanisms and the three classes of approaches: proactive, on-demand, and hybrid. 3. knowledge of clustering mechanisms and the different schemes that have been employed, e.g., hierarchical, flat, and leaderless. 4. knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards. This includes their designs, operations, plus approaches to interoperability.	
6	Course Outcomes	CO1: Understand emerging research areas in the field of sensor networks CO2: Understand MAC protocols used for different communication standards used in WSN CO3: Explore new protocols for WSN CO4: Design wireless sensor networks for a given application	
7	Course Description	A wireless sensor network (WSN) generally consists of compact low power sensors, which collect information and pass the information via wireless networks to achieve a high level of desired monitoring and control in coordinated manners. WSN applications can be found in areas such as environmental monitoring, smart energy systems, battle field surveillance, home automation, medical monitoring, mobile computing, etc. WSN has integrated network engineering, embedded system engineering and sensor technology.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to Sensor Networks**	
	A	Introduction to Sensor Networks, unique constraints and challenges	CO1, CO2
	B	Advantage of Sensor Networks, Applications of Sensor Networks,	CO1
	C	Types of wireless sensor networks	CO1
	Unit 2	**Issues and challenges in wireless sensor networks**	

	A	Mobile Ad-hocNetworks (MANETs) and Wireless Sensor Networks			CO1, CO3
	B	Enabling technologies forWireless Sensor Networks			CO1, CO3
	C	Issues and challenges in wireless sensor networks			CO1
	Unit 3	**Routing protocols**			
	A	Routing protocols, MAC protocols: Classification of MAC Protocols,			CO2
	B	S-MAC Protocol, B-MAC protocol,			CO2
	C	IEEE 802.15.4 standard and ZigBee,			CO2
	Unit 4	**Dissemination protocol for large sensor network**			
	A	Dissemination protocol for large sensor network. Quality of a sensor network			CO3
	B	Data dissemination, data gathering, and data fusion;			CO3
	C	Real-time traffic support and security protocols.			CO3
	Unit 5	**Design Principles for WSNs**			
	A	Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to InternetCommunication, and Internet to WSN Communication			CO4
	B	Single-node architecture, Hardware components & design constraints,			CO4
	C	Operating systems and execution environments, introduction to TinyOS and nesC.			CO4
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Waltenegus Dargie , Christian Poellabauer, "Fundamentals Of Wireless Sensor Networks Theory And Practice", By John Wiley & Sons Publications ,2011			
	Other References	1.Sabrie Soloman, "Sensors Handbook" by McGraw Hill publication. 2009 2. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks", Elsevier Publications,2004 3. Kazem Sohrby, Daniel Minoli, "Wireless Sensor Networks": Technology, Protocols and Applications, Wiley-Inter science 4. Philip Levis, And David Gay "TinyOS Programming" by Cambridge University Press 2009			

SHARDA UNIVERSITY
Beyond Boundaries

School:		**Batch: 2019-21**
Program: Btech		**Current Academic Year:2019**
Branch:		
1	Course Code	CSI021
2	Course Title	wireless sensor networking lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	
5	Course Objective	• Students should realize different wireless sensor components principle • Students should familiar with interfacings of sensors and gattering needful information • Students should able to knowledge of programming techniques
6	Course Outcomes	CO1: understand the setup wireless sensor components CO2: Practice different program techniques CO3: apply interface techniques of sensors CO4: simulate wsn with Tiny OS CO5: Interpreting and visualizing data collected from sensor
7	Course Description	This lab is an introductory course for wireless sensor networks. Students will get hands-on experience working with sensor motes and TinyOS application development through simulation and implementation on the real hardware.

8	Outline syllabus		CO Mapping
	Unit 1	**Basics of WSN components**	
	A	Practical study of all hardware components related to WSNs	CO1
	B	Basics of WSN programming concept	CO1
	C	General overview of TinyOS	CO1
	Unit 2	**Practice with TinyOS**	
	A	Downloading, installing the most recent version of TinyOS	CO2
	B	Simple example code that compiles	CO2
	C	Guide to getting going with TelosB motes	CO2
	Unit 3	**Getting Relevant Data**	
	A	An introduction to TinyOS programming	CO3
	B	Sensing data using WSN motes.	CO3
	C	Gathering relevant data only	CO3
	Unit 4	**Simulation in TinyOS**	
	A	Simulating WSNs made up of motes running TinyOS	CO4
	B	the TinyOS simulation framework TOSSIM	CO4
	C	This header file can be used to easily output binary data as a hex dump.	CO4
	Unit 5	**Visualization**	
	A	Sensing audio data and interpreting results.	CO5
	B	Sensing positioning data using GPS and transmitting it.	CO5
	C	Visualization	CO5

	Mode of examination	Practical & Viva			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	Refer lab manuals			
	Other References				

1	Course Code	CSI103	Course Name
2	Course Title	**Introduction to Internet of Things**	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
	Course Status	UG	
5	Course Objective	• To impart knowledge on the infrastructure, sensor technologies and networking technologies of IoT. • To analyze, design and develop IOT solutions. • To explore the entrepreneurial aspect of the Internet of Things. • To apply the concept of Internet of Things in the real world scenarios.	
6	Course Outcomes	On successful completion of the course, the student will: 1. Understand the concepts of Internet of Things 2. Analyze basic protocols in wireless sensor network 3. Design IoT applications in different domain and be able to analyze their performance 4. Implement basic IoT applications on embedded platform	
7	Course Description	This course introduces Concepts for internet of things and how we can embed it into our daily lives for the development of life style. It will also help students to build applications according to their problem statements.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction to IoT**	
	A	Defining IoT, Characteristics of IoT, Challenges and issues	CO1, CO2
	B	Physical design of IoT: Things in IOT, IoT Protocols, Logical design of IoT: IoT Functional Blocks, IoT Communication Models. IoT Communication API's.	CO1, CO2
	C	IoT Enabling Technologies: Wireless sensor networks, Cloud Computing, Big Data Analytics, Communication protocols, Embedded Systems.	CO1, CO2
	Unit 2	**IoT & M2M**	
	A	Introduction, Machine to Machine, Difference between IoT and M2M.	CO1, CO2,CO3
	B	Software defines Network.	CO1, CO2,CO3
	C	Network function Virtualization.	CO1, CO2,CO3
	Unit 3	**Network & Communication aspects**	
	A	Basic of IOT Networking, IOT categories, Connectivity Technologies i.e. 6LoWPAN, RFID	CO1,CO2
	B	Communication routing protocols, Sensor deployment & Node discovery.	CO1,CO2
	C	Data aggregation & dissemination	CO2
	Unit 4	**Challenges in IoT**	
	A	Design challenges	CO1,CO2,CO3

	B	Development challenges		CO1,CO2,CO3
	C	Security challenges, Other challenges		CO1,CO2,CO3
	Unit 5	**Domain specific applications of IoT**		
	A	Home automation		CO1,CO2,CO4
	B	Industry applications		CO1,CO2,CO4
	C	Surveillance applications, Other IoT applications		CO1,CO2,CO4
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Arshdeep Bahga and Vijay Madisetti, "Internet of Things – A Hand-on Approach", Universities press, 2015.		
	Other References	1. Charalampos Doukas , "Building Internet of Things with the Arduino", Create space, April 2002 2. Dr. Ovidiu Vermesan and Dr. Peter Friess, "Internet of Things: From research and innovation to market deployment", River Publishers 2014. 3. Contiki : The open source for IOT, www.contiki-os.org		

PO and PSO mapping with level of strength for Introduction to Internet of Things (Course Code CSI103)

	COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CSE	CO1	3	2	--	2	--	2	2	2	--	1	--	2	3	1	1	1	2
	CO2	3	3	3	3	3	1	--	2	2	2	1	2	2	3	2	1	3
	CO3	2	3	2	1	--	--	1	1	1	1	--	1	3	1	1	1	1
	CO4	3	2	3	2	2	2	2	2	3	3	3	3	2	2	3	1	2

School: SET		Batch : 2019-22	
Program: B.Tech		**Current Academic Year: 2019-19**	
Branch: CSE		**Semester: VI**	
1	Course Code	CSI201	
2	Course Title	EMBEDDED SYSTEMS	
3	Credits	4	
4	Contact Hours (L-T-P)	3-0-2	
	Course Status	UG	
5	Course Objective	To train thestudents for finding right microcontroller for a particular application and to program it. They will also be taught interfacing of different input/output devices with microcontrollers. Finally, an introduction of basics of real time systems and architecture of advanced microcontrollers will be provided	
6	Course Outcomes	CO1: Understand architecture and instructions set of microcontroller CO2: Learn programming of microcontroller CO3: Getting knowledge of interfacing techniques CO4: Getting knowledge of developing of small projects CO5: Explore communication protocols of microcontrollers	
7	Course Description	This subject is for the small projects development knowledge. The industry standard 8 bit microcontroller will be taught. It is not only establishes a foundation of assembly & embedded C language programming but also provides a comprehensive treatment of standard interfacings for engineering students. It is an ideal sources for those building stand-alone projects	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction&Architecture of 8051 Microcontroller (4)**	
	A	Review of architecture and instruction set of 8085 microprocessor and 8 bit microcontroller.	CO1
	B	Overview of 8 bitarchitecture and compare with 8085 and other 8 bit microcontroller.	CO1
	C	CISC & RISC processors.	CO1
	Unit 2	**Industry Standard microcontroller Instructions set (10)**	CO2
	A	Addressing modes, data transfer arithmetic and logical instructions.	
	B	Bit instructions, jump, loop and call instructions.	CO2
	C	Time delay using instructions.	CO2
	Unit 3	**Programming of industry standard controller (8)**	
	A	Input/output port programming, Timer/counter programming for different modes.	CO2
	B	Serial communication and programming for different modes.	CO2

	C	Programming of interrupts and priority of interrupts; power down mode programming; programming in C language.			CO2, CO3
	Unit 4	**Interfacing to industry standardmicrocontroller (10)**			
	A	Interfacing of 7 segment display, LCD and keyboard.			CO3, CO4
	B	Interfacing of DC motor, stepper motor and relay.			CO3, CO4
	C	Interfacing ofADC, DAC, RFID			CO3, CO4
	Unit 5	**Advanced Topics (8)**			
	A	Accessing of EEPROM and interfacing of sensors			CO5
	B	On board buses for embedded systems-I2C & SPI; Wireless module interfacings like BT, ZigBee			CO1
	C	real time tasks and types, real time systems, real time operating systems; Hardware software co-design, embedded product development lifecycle management.			CO1
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Muhammad Ali Mazidi, J G Mazidi and R D.Mchinlay, " The 8051 Microcontroller and Embedded Systems" using assembly and C, second edition, Pearson Education.			
	Other References	1. Lyla B. Das, "Embedded Systems" an integrated approach, Pearson 2. Ajay V Deshmukh, "Microcontrollers (Theory and Applications)", The McGraw-Hill			

<table>
<tr><td colspan="2">School: SET</td><td colspan="2">Batch : 2019</td></tr>
<tr><td colspan="2">Program: B.Tech</td><td colspan="2">Current Academic Year:</td></tr>
<tr><td colspan="2">Branch: CSE</td><td colspan="2">Semester:</td></tr>
<tr><td>1</td><td>Course Code</td><td>CSI302</td><td>Course Name</td></tr>
<tr><td>2</td><td>Course Title</td><td colspan="2">IOT Applications</td></tr>
<tr><td>3</td><td>Credits</td><td colspan="2">4</td></tr>
<tr><td>4</td><td>Contact Hours (L-T-P)</td><td colspan="2">3-1-0</td></tr>
<tr><td></td><td>Course Status</td><td colspan="2">UG</td></tr>
<tr><td>5</td><td>Course Objective</td><td colspan="2">Objective of this course is to
1. Understand the concepts of various IOT applicative domains and their importance.
2. To analyse, design and develop IOT solutions.
3. To apply the concept of Internet of Things in the real world scenarios.</td></tr>
<tr><td>6</td><td>Course Outcomes</td><td colspan="2">Students will be able to use techniques, skills and modern engineering tools necessary for designing and converting IOT Models to business solutions for :
CO1. Home Automation.
CO2. Cities & Environment domains.
CO3. Energy & Retail domains.
CO4. Logistics & Agriculture domains.
CO5. Industry, Health & Lifestyle domains.</td></tr>
<tr><td>7</td><td>Course Description</td><td colspan="2">To design and develop IOT business solutions.</td></tr>
<tr><td>8</td><td colspan="2">Outline syllabus</td><td>CO Mapping</td></tr>
<tr><td rowspan="4"></td><td>Unit 1</td><td>Introduction to Domain Specific IoT</td><td></td></tr>
<tr><td>A</td><td>Introduction to various Domains: Home, Cities, Environment, Energy etc</td><td rowspan="3">CO1</td></tr>
<tr><td>B</td><td>Home Automation: Smart Lighting, Smart Appliances.</td></tr>
<tr><td>C</td><td>Intrusion detection, Smoke/Gas detectors.</td></tr>
<tr><td rowspan="4"></td><td>Unit 2</td><td>Cities & Environment</td><td></td></tr>
<tr><td>A</td><td>Smart Parking, Smart Lighting, Smart Roads</td><td rowspan="3">CO2</td></tr>
<tr><td>B</td><td>Structural Health Monitoring, Surveillance, Emergency Response, Weather Monitoring, Air Pollution Monitoring, Noise Pollution Monitoring.</td></tr>
<tr><td>C</td><td>Forest Fire Detection, River Floods Detection.</td></tr>
<tr><td rowspan="4"></td><td>Unit 3</td><td>Energy & Retail</td><td></td></tr>
<tr><td>A</td><td>Smart Grids, Renewable Energy Systems, Prognostics</td><td rowspan="3">CO3</td></tr>
<tr><td>B</td><td>Inventory Management, Smart Payments.</td></tr>
<tr><td>C</td><td>Smart Vending Machines.</td></tr>
</table>

	Unit 4	**Logistics & Agriculture**			
	A	Route Generation & Scheduling, Fleet Tracking			CO4
	B	Shipment Monitoring, Remote Vehicle Diagnostics			
	C	Smart Irrigation, Green House Control.			
	Unit 5	**Industry , Health & Lifestyle**			
	A	Machine Diagnosis & Prognosis, Indoor air Quality Monitoring			CO5
	B	Health & Fitness Monitoring			
	C	Wearable Electronics			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Arshdeep Bahga and Vijay Madisetti, "Internet of Things – A Hand-on Approach", Universities press, 2015.			
	Other References	1. Charalampos Doukas , "Building Internet of Things with the Arduino", Create space, April 2002 2. Dr. Ovidiu Vermesan and Dr. Peter Friess, "Internet of Things: From research and innovation to market deployment", River Publishers 2014. 3. Contiki : The open source for IOT, www.contiki-os.org			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO1. **Home Automation**.	PO1
2.	CO2. **Cities & Environment** domains.	
3.	CO3. **Energy & Retail** domains.	
4.	CO4. **Logistics & Agriculture** domains.	
5.	CO5. **Industry, Health & Lifestyle** domains.	

PO and PSO mapping with level of strength for Course Name IoT Applications (Course Code CSI303)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

SHARDA UNIVERSITY
Beyond Boundaries

School: SET		**Batch : 2019-22**	
Program: B.Tech		**Current Academic Year: 2019**	
Branch: CSE		**Semester: VI**	
1	Course Code	CSI041	Course Name
2	Course Title	IoT in Big Data Analytics	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	Elective	
5	Course Objective	1. To learn the concepts of big data analytics 2. To learn the concepts about Internet of things 3. To understand and implement smart systems	
6	Course Outcomes	Students will be able to: **CO1:** Determine Data Challenges and requirements of Smart City Applications. **CO2:**Understand Spatial Dimensions of Big Data. **CO3:** Manage Big data Metadata. **CO4:**Develop and Manage Smart Cities. **CO5:** Understand Sustainable Data and Analytics in Cloud-Based M2M Systems.	
7	Course Description	This course provides a way to understand the concepts and the basics of big data analytics and their role in Internet of things.	

8	Outline syllabus		CO Mapping
	Unit 1	**BIG DATA PLATFORMS FOR THE INTERNET OF THINGS**	
	A	Big Data Platforms for the Internet of Things: network protocol- data dissemination – current state of art.	CO1
	B	Improving Data and Service Interoperability with Structure, Compliance, Conformance and Context Awareness: interoperability problem in the IoT context.	CO1
	C	Big Data Management Systems for the Exploitation of Pervasive Environments - Big Data challenges and requirements coming from different Smart City applications.	CO1
	Unit 2	**RFID FALSE AUTHENTICATIONS**	
	A	On RFID False Authentications: YA TRAP – Necessary and sufficient condition for false authentication prevention - Adaptive Pipelined Neural Network Structure in Selfaware.	CO2
	B	Internet of Things: self-healing systems- Role of adaptive	CO2

		neural network-Spatial Dimensions of Big Data: Application of Geographical Concepts and Spatial Technology to the Internet of Things.	
	C	Applying spatial relationships, functions, and Models.	
	Unit 3	**FOG COMPUTING**	
	A	Fog Computing: A Platform for Internet of Things and Analytics: a massivelydistributed number of sources.	CO3
	B	Big Data Metadata Management in Smart Grids: semantic inconsistencies.	
	C	role of metadata.	
	Unit 4	**WEB ENHANCED BUILDING**	
	A	Toward Web Enhanced Building Automation Systems: heterogeneity between existinginstallations and native IP devices - loosely-coupled Web protocol stack – energysaving in smart building.	CO4
	B	Intelligent Transportation Systems and Wireless Access in Vehicular Environment Technology for Developing Smart Cities: advantages and Achievements.	
	C	Emerging Technologies in Health Information Systems: Genomics Driven Wellness Tracking and Management System (GO-WELL) – predictive care – personalized medicine.	
	Unit 5	**SUSTAINABILITY DATA AND ANALYTICS**	
	A	Sustainability Data and Analytics in Cloud-Based M2M Systems – potentialstakeholders and their complex relationships to data and analytics applications.	CO5
	B	Social Networking Analysis - Building a useful understanding of a social network .	
	C	Leveraging Social Media and IoT to Bootstrap Smart Environments : lightweight Cyber Physical Social Systems - citizen actuation.	
	Mode of examination	Theory	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1. Stackowiak, R., Licht, A., Mantha, V., Nagode, L.," Big Data and The Internet of Things Enterprise Information Architecture for A New Age", Apress, 2015.	
	Other References	1. Dr. John Bates , "Thingalytics - Smart Big Data Analytics for the Internet of Things", john Bates, 2015.	

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) &

		Program Specific Outcomes (PSO)
1.	**CO1:** Determine Data Challenges and requirements of Smart City Applications.	PO1,PSO1
2.	**CO2:**Understand Spatial Dimensions of Big Data.	PO1PO3, PO4, PSO2, PO5
3.	**CO3:** Manage Big data Metadata.	PO2,PSO1
4.	**CO4:**Develop and Manage Smart Cities.	PO1, PO3,PO9, PO10,PO11,PO12,PSO3
5.	**CO5:** Understand Sustainable Data and Analytics in Cloud-Based M2M Systems.	PO1,PSO1

PO and PSO mapping with level of strength for Big Data Analytics for IoT (Course Code CSI304)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

School: SET		Batch : 2019		
Program: B.Tech		**Current Academic Year:**		
Branch: CSE		**Semester: 7**		
1	Course Code	CSI301	Course Name	
2	Course Title	IOT: Architecture and Protocols		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status	UG		
5	Course Objective	Objective of this course is to 5. To Understand the Architectural Overview of IoT 6. To Understand the IoT Reference Architecture and Real World Design Constraints. 7. To Understand the various IoT Protocols (Data link, Network, Transport, Session, Service).		
6	Course Outcomes	Students will be able to: **CO1:**Understand the basic design principles for IOT architecture and M2M. **CO2:**Analyze various views and design constraints for IOT reference architecture. **CO3:** Explore the function ofdata link and network layer protocols. **CO4:**understand transport and session layer protocols. **CO5:** understand service layer and security protocols.		
7	Course Description	The purpose of this course is to impart knowledge on IoT Architecture and various protocols, study their implementations.		
8	Outline syllabus			CO Mapping
	Unit 1	**OVERVIEW**		
	A	IoT-An Architectural Overview– Building an architecture, Main design principles andneeded capabilities, An IoT architecture outline, standards considerations.		CO1
	B	M2M and IoT Technology Fundamentals- Devices and gateways, Local and wide areanetworking, Data management.		CO1
	C	Business processes in IoT, Everything as aService (XaaS), M2M and IoT Analytics, Knowledge Management.		CO1
	Unit 2	**REFERENCE ARCHITECTURE**		
	A	IoT Architecture-State of the Art – Introduction, State of the art, Reference Model andArchitecture.		CO1,CO2
	B	IoT reference Model - IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational		CO1,CO2

		View, Other Relevant architectural views.	
	C	Real-World Design Constraints- Introduction, Technical Design constraints-hardware is popular again, Data representation and visualization,Interaction and remote control.	CO1,CO2
	Unit 3	**IOT DATA LINK LAYER & NETWORK LAYER PROTOCOLS**	
	A	PHY/MAC Layer(3GPP MTC, IEEE 802.11, IEEE 802.15), WirelessHART, ZWave	CO3
	B	Bluetooth Low Energy, Zigbee Smart Energy, DASH7 - Network Layer-IPv4,	CO3
	C	IPv6, 6LoWPAN, 6TiSCH,ND, DHCP, ICMP, RPL, CORPL, CARP	CO3
	Unit 4	**TRANSPORT & SESSION LAYER PROTOCOLS**	
	A	Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP) (TLS, DTLS)	CO4
	B	Session Layer- HTTP, CoAP, XMPP	CO4
	C	AMQP, MQTT	CO4
	Unit 5	**SERVICE LAYER PROTOCOLS & SECURITY**	
	A	Service Layer -oneM2M, ETSI M2M	CO5
	B	OMA, BBF – Security in IoT Protocols – MAC 802.15.4	CO5
	C	6LoWPAN, RPL, Application Layer	CO5
	Mode of examination	Theory	
	Weightage Distribution	CA: 30%, MTE: 20%, ETE: 50%	
	Text book/s*	3. Bernd Scholz-Reiter, Florian Michahelles, “Architecting the Internet of Things”, ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer. 4. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, **“**From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**”,** 1st Edition, Academic Press,2014.	
	Other References	15. Vijay Madisetti and ArshdeepBahga, **“**Internet of Things (A Hands-on-Approach)**”,** 1st Edition, VPT, 2014. 16. Daniel Minoli, “Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications”, ISBN: 978-1-118-47347-4, Willy Publications	

CO and PO Mapping

S.	Course Outcome	Program Outcomes (PO) &

No.		Program Specific Outcomes (PSO)
1.	**CO1:**apply design principles for IOT architecture and M2M.	PO1,PSO1
2.	**CO2:**understand various views and design constraints for IOT reference architecture.	PO1,PO2, PO3,PSO2,PSO5
3.	**CO3:** understand data link and network layer protocols.	PO2,PSO1
4.	**CO4:**understand transport and session layer protocols.	PO1, PO3,PO,PO12,PSO3
5.	**CO5:** understand service layer and security protocols.	PO1,PSO4

PO and PSO mapping with level of strength for Course Name IOT Architecture and Protocols **(Course Code CSi401)**

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

School: SET		**Batch : 2019**	
Program: B.Tech		**Current Academic Year:**	
Branch: CSE		**Semester: VII**	
1	Course Code	CSI202	Course Name
2	Course Title	**IOT: SENSINGAND ACTUATOR DEVICES**	

3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	UG	
5	Course Objective	Objective of this course is to 1. Understanding of IoT value chain structure (device, data cloud), application areas and technologies involved 2. Understand IoT sensors and technological challenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules 3. Market forecast for IoT devices with a focus on sensors 4. Explore and learn about Internet of Things with the help of preparing projects designed for Raspberry Pi.	
6	Course Outcomes	Students will be able to: **CO1:**Structure IOT for applications. **CO2:**understand seven generations of sensors and their characteristic. **CO3:**analysechallenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules. **CO4:**develop an IOT solution which focuses on sensors. **CO5:**Create IOT Projects.	
7	Course Description	The purpose of this course is to impart knowledge on Internet of Things (IoT), which relates to the study of sensors, actuators, and controllers, among other Things, IoT applications and examples overview (building automation, transportation, healthcare, industry, etc.) with a focus onwearable electronics.	
8	Outline syllabus		CO Mapping
	Unit 1	**INTRODUCTION**	
	A	Internet of Things Promises–Definition	CO1
	B	Scope–Sensors for IoT Applications	
	C	Structure of IoT– IoT Map Device	
	Unit 2	**SEVEN GENERATIONS OF IOT SENSORS TO APPEAR**	
	A	Industrial sensors – Description & Characteristics– First Generation – Description &Characteristics	CO2
	B	Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Polytronics Systems – Description & Characteristics–Sensors' Swarm	
	C	Description & Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap	
	Unit 3	**TECHNOLOGICAL ANALYSIS**	
	A	Wireless Sensor Structure	CO3
	B	Energy Storage Module–Power Management Module	
	C	RF Module–Sensing Module	
	Unit 4	**IOT DEVELOPMENT EXAMPLES**	
	A	ACOEM Eagle – EnOcean Push Button	CO4
	B	NEST Sensor – Ninja Blocks	
	C	Focus on Wearable Electronics	
	Unit 5	**PREPARING IOT PROJECTS**	
	A	Creating the sensor project - Preparing Raspberry Pi - Clayster libraries - Hardware- Interacting with the	CO5

		hardware - Interfacing the hardware- Internal representation of sensor values - Persisting data			
	B	External representation of sensor values – Exporting sensor data - Creating the actuator project- Hardware - Interfacing the hardware -Creating a controller - Representing sensor values - Parsing sensor data – Calculatingcontrol states - Creating a camera			
	C	Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settings – Addingconfigurable properties - Persisting the settings - Working with the current settings - Initializing the camera.			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	5. Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies &Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024',Yole Development Copyrights ,2014. 6. Peter Waher, 'Learning Internet of Things', Packt Publishing, 2015			
	Other References	17. Editors OvidiuVermesan Peter Friess,'Internet of Things – From Research and Innovation to Market.Deployment', River Publishers, 2014. 18. N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014.			

<u>CO and PO Mapping</u>

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:**Structure IOT for applications.	
2.	**CO2:**understand seven generations of sensors and their characteristic.	
3.	**CO3:**analysechallenges faced by IoT devices, with a focus on wireless, energy, power, RF and sensing modules.	
4.	**CO4:**develop an IOT solution which focuses on sensors.	
5.	**CO5:**Create IOT Projects.	

PO and PSO mapping with level of strength for Course Name INTERNET OF THINGS: SENSINGAND ACTUATOR DEVICES (Course Code CSI403

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2

CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

School: SET		**Batch : 2019**	
Program: B.Tech		**Current Academic Year:**	
Branch: CSE		**Semester: VIII**	
1	Course Code	CSI401	Course Name
2	Course Title	IOT Security	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	Elective	
5	Course	Objective of this course is to	

	Objective	1. Ability to understand the Security requirements in IoT. 2. Understand the cryptographic fundamentals for IoT 3. Ability to understand the authentication credentials and access control 4. Understand the various types Trust models and Cloud Security.			
6	Course Outcomes	Students will be able to: **CO1:**Understand security concerns in IOT applications **CO2:** apply cryptographic methods in IOT. **CO3:** understand IAM, authorize and access schemes for IOT. **CO4:**apply privacy and trust models for IOT. **CO5:**analyze cloud services and security controls for IOT architecture.			
7	Course Description	To learn the security principles and methodologies for Internet of Things.			
8	Outline syllabus				CO Mapping
	Unit 1	**INTRODUCTION: SECURING THE INTERNET OF THINGS**			
	A	Security Requirements in IoT Architecture - Security in Enabling Technologies -Security Concerns in IoT Applications.			CO1
	B	Security Architecture in the Internet of Things -Security Requirements in IoT - Insufficient Authentication/Authorization – InsecureAccess Control - Threats to Access Control.			CO1
	C	Privacy, and Availability - Attacks Specificto IoT. Vulnerabilities – Secrecy and Secret-Key Capacity - Authentication/Authorization for Smart Devices - Transport Encryption – Attack & Fault trees.			CO1
	Unit 2	**CRYPTOGRAPHIC FUNDAMENTALS FOR IOT**			
	A	Cryptographic primitives and its role in IoT – Encryption and Decryption – Hashes			CO2
	B	Digital Signatures – Random number generation – Cipher suites – key management fundamentals			CO2
	C	cryptographic controls built into IoT messaging and communication protocols – IoT Node Authentication			CO2
	Unit 3	**IDENTITY & ACCESS MANAGEMENT SOLUTIONS FOR IOT**			
	A	Identity lifecycle – authentication credentials			CO3
	B	IoT IAM infrastructure			CO3
	C	Authorization with Publish / Subscribe schemes – access control			CO3
	Unit 4	**PRIVACY PRESERVATION AND TRUST MODELS FOR IOT**			
	A	Concerns in data dissemination			CO4
	B	Lightweight and robust schemes for Privacyprotection – Trust and Trust models for IoT			CO4
	C	self-organizing Things - Preventing unauthorized access.			CO4
	Unit 5	**CLOUD SECURITY FOR IOT**			
	A	Cloud services and IoT – offerings related to IoT from cloud service providers			CO5
	B	Cloud IoT security controls – An enterprise IoT cloud security architecture			CO5
	C	New directions in cloud enabled IoT computing			CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Securing the Internet of Things Elsevier			

	Other References	19. Security and Privacy in Internet of Things (IoTs): Models, Algorithms, and Implementations. 20. Practical Internet of Things Security by Brian Russell, Drew Van Duren.

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	**CO1:** analyse security concerns in IOT applications	
2.	**CO2:** apply cryptographic methods in IOT.	
3.	**CO3:** understand IAM, authorize and access schemes for IOT.	
4.	**CO4:**apply privacy and trust models for IOT.	
5.	**CO5:**analyse cloud services and security controls for IOT architecture.	

PO and PSO mapping with level of strength for Course Name IOT Security(Course Code CSI405)

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3	3	--	--	--	2	2	1	2	1	3	2	2	1	2
CO2	3	2	3	3	--	--	--	2	2	2	1	1	2	3	2	1	2
CO3	3	3	3	3	--	--	--	1	1	1	3	2	3	2	1	1	1
CO4	2	2	2	2	1	--	--	2	3	3	3	1	2	2	2	1	3

SPECILIZATION	**TERM**	**Course Code**	**Course**	**Credits**
Bioinformatics	II	CBI102	Statistical Method in Bioinformatics	2
	III	CBI201	Advance concept of Bioinformatics	3
	III	CBI202	Genetic & Molecular Biology	3
	III	CBI203	Biochemistry	3
	III	CBI204	Computational Genomics	5
	III	CBI205	Biochemistry & Molecular Biology	1

	IV	CBI206	Computational Proteomics & gene expression studies	4
	IV	CBI207	Programming and application to bioinformatics	5
	IV	CBI208	Computational Method in Bimolecular sequence analysis	3
	V	CBI301	Optimization, Machine Learning & Computational Intelligence	3
	V	CBI302	Chemo informatics	3
	VI	CBI303	Computer Aided Molecular Modeling & Drug Discovery	3
	VII	CBI401	Elements of Protein Sequence, Structure & Modeling	4
	VII	CBI402	Subject Name to be decided	4

CBI202: Genetics and Molecular Biology

School: SET		**Batch: 2019-2023**	
Program: B. Tech.		**Current Academic Year: 2020-21**	
Branch: Biotechnology		**Semester: 03**	
1	Course Code	**CBI202**	
2	Course Title	**Genetics and Molecular Biology**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	**Compulsory** /Elective/Open Elective	
5	Course Objective	1. Describe and demonstrate Mendel's laws of inheritance chromosomal theory of inheritance and correlate between alleles and multiple alleles for different traits 2. Analyze the structure of chromatin and chromosomes. Demonstrate linkage and crossing over, different types of variations in structure of chromosome. 3. Explain mutations using different recombination methods in microbes and Recognize the structure of gene and demonstrate the flow of genetic information in cells.	
6	Course Outcomes	CO1: Describe and demonstrate Mendel's laws of inheritance chromosomal theory of inheritance and Correlate between alleles and multiple alleles for different traits CO2: Analyze the structure of chromatin and chromosomes. CO3: Describe linkage and crossing over, different types of variations in structure of chromosome and their effects and examine extranuclear and maternal inheritance. CO4: Identify mutations using different recombination methods in microbes. CO5: Recognize the structure of gene and demonstrate the flow of genetic information in cells. CO6: Explain mendelian genetics, chromosome structure, linkage and crossing over, microbial genetics, mutation and gene structure.	
7	Course Description	To understand the basic principles of Classical Mendelian genetics. To develop analytical approach for understanding inheritance of characteristics from one generation to other.	
8	Outline syllabus		CO Mapping
	Unit 1	**Mendelian Genetics**	
	A	Mendelian genetics and heredity	CO1, CO6
	B	Mendel's experiments, principles of segregation, Principle of independent assortment	CO1, CO6
	C	Alleles and multiple alleles, classical example - ABO blood group and pseudo alleles	CO1, CO6
	Unit 2	**Chromosome Fine Structure**	
	A	Chromosomal theory of Inheritance	CO2, CO6

	B	Prokaryotic and nucleoid structure			CO2, CO6
	C	Nucleosome structure			CO2, CO6
	Unit 3	**Linkage and Crossing Over**			
	A	Linkage, crossing over			CO3, CO6
	B	Variation in chromosome structure, variation in chromosome number			CO3, CO6
	C	Extra- nuclear and maternal inheritance			CO3, CO6
	Unit 4	**Mutation and Microbial Genetics**			
	A	Molecular basis of mutation and their different types			CO4, CO6
	B	Microbial genetics: conjugation, transformation, transduction			CO4, CO6
	C	Plasmids and transposable elements			CO4, CO6
	Unit 5	**Gene Fine Structure**			
	A	DNA as the genetic material, its structure and forms			CO5, CO6
	B	Gene fine structure, Molecular concept of gene			CO5, CO6
	C	Central Dogma of life and regulation of Gene expression			CO5, CO6
	Mode of examination	**Theory**/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Griffiths J. F. "Introduction to Genetic Analysis", W. H. Freeman, 2010.			
	Other References	1. Gardener. E. J. "Principles of Genetics",Wiley, 1991.			

COURSE ARTICULATION MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BTY211.1	3	2	-	1	-	-	-	-	-	-	-	-	-	-	1	-
BTY211.2	3	2	-	2	-	-	-	2	-	-	-	1	2	-	-	-
BTY211.3	3	2	2	2	2	-	3	-	-	2	-	2	2	3	2	2
BTY211.4	3	2	-	2	-	-	-	-	2	-	-	-	-	-	-	
BTY211.5	3	3	3	2	3	3	-	-	-	-	-	2	3	3	-	3
BTY211.6	3	2	1	-	-	2	-	-	1	-	-	-	2	-	-	1

CBI205: Molecular Biology

School: SET		**Batch : 2019-2023**	
Program: B. Tech		**Current Academic Year: 2021-2022**	
Branch: Biotechnology		**Semester: Odd (5th)**	
1	Course Code	CBI205	
2	Course Title	**MOLECULAR BIOLOGY**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status	**Compulsory**	
5	Course Objective	1. To acquire a fundamental knowledge of central dogma of life relating processes of replication, transcription and translation. 2. To understand the different theories of recombination. 3. To learn about the fundamental concept of cancer and oncogenes.	
6	Course Outcomes	CO1: Differentiate between prokaryotic and eukaryotic replication, compare prokaryotic and eukaryotic transcription and examine the functions of different types of RNA polymerases. CO2: Demonstrate the regulation of transcription and identify post-transcriptional modifications. CO3: Experimentally demonstrate the process of translation in prokaryotes and eukaryotes and presence of post translational modification CO4: Recognize the process of recombination and formation of Holliday junction. CO5: Investigate the role of viral oncogenes, cellular oncogenes and tumour suppressor genes and proteins in cancer. CO6: Discuss the various aspects of central dogma and DNA repair mechanisms.	
7	Course Description	Molecular biology is a course to acquire a fundamental knowledge of central dogma of life relating processes of replication, transcription and translation. To understand the different theories of recombination. To learn about the fundamental concept of cancer and oncogenes.	
8	Outline syllabus		CO Mapping
	Unit 1	**DNA Replication**	CO1, CO2
	A	Process of replication in Prokaryotes.	
	B	Mechanism of DNA replication in Eukaryotes.	
	C	Enzymes and proteins involved in replication.	
	Unit 2	**Transcription**	
	A	Prokaryotic and eukaryotic initiation of transcription.	CO1, CO3

	B	Elongation and termination of m RNA synthesis.			
	C	Regulation of transcription and posttranscriptional modifications.			
	Unit 3	**Translation**			CO4 and CO6
	A	Comparison of prokaryotic and eukaryotic translation mechanism			
	B	Post translational modification			
	C	Operon concept and lac, trp operons.			
	Unit 4	**DNA repair and Recombination**			CO5
	A	DNA repair mechanisms and their types.			
	B	Holliday junction			
	C	Process of recombination.			
	Unit 5	**Molecular Biology in Oncology**			CO5 and CO6
	A	Viral and cellular oncogenes			
	B	Tumour suppressor genes.			
	C	Role of p53			
	Mode of examination	Theory/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Molecular Biology Lab Fax. T.A. Brown (Ed.), bios Scientific Publishers Ltds., Oxford, 1991			
	Other References	1. Molecular biology of the Gene (4th Edition),J .D. Watson, N. H. Hopkins, J. W. Roberts,J.A. Steitz and A.M. 2. Molecular Cell biology (2nd Edition) J. Darnell, H. Lodish and D. Baltimore, Scientific American Books, USA, 1994. 3. Molecular Biology of the Cell (2nd Edition) B. Alberts, D.Bray, J.Lewis, M.Raff, K. Roberts, and J.D. Watson, Garland publishing. Inc., New York, 1994.			

COURSE ARTICULATION MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BTY234.1	3	2	-	1	-	-	-	-	-	-	-	-	-	-	1	-
BTY234.2	3	2	-	2	-	-	-	2	-	-	-	1	2	-	-	-
BTY234.3	3	2	2	2	2	-	3	-	-	2	-	2	2	3	2	2
BTY234.4	3	2	-	2	-	-	-	-	2	-	-	-	-	-	-	
BTY234.5	3	3	3	2	3	3	-	-	-	-	-	2	3	3	-	3
BTY234.6	3	2	1	-	-	2	-	-	1	-	-	-	2	-	-	1

SHARDA UNIVERSITY
Beyond Boundaries

CBI203: Biochemistry

School: SET		**Batch : 2019-2023**	
Program: B. Tech		**Current Academic Year: 2021-22**	
Branch: Biotechnology		**Semester: Even (4th)**	
1	Course Code	**CBI203**	
2	Course Title	**Biochemistry**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status	**Compulsory**	
5	Course Objective	1. Understand the overall organization of the biochemical metabolism. 2. Describe the structure and function of various biomolecules in maintaining balance in body. 3. Appreciate the function of Vitamins and their deficiency related diseases.	
6	Course Outcomes	CO1: Identify the five classes of polymeric biomolecules and their monomeric building blocks. CO2: Demonstrate the breakdown of glucose and synthesis of ATP. CO3: Elaborate different types of lipids and their metabolism. CO4: Verify the structure of amino acids, and demonstrate how they are responsible for protein building. CO5: Describe structure of nucleotides and nucleosides and their role in making structure of DNA and RNA. CO6: Correlate vitamins, their types and deficiency with origin and progression of diseases.	
7	Course Description	The Biochemistry is designed to equip students with a broad understanding of the chemical and molecular events involved in biological processes. It helps students in understanding of structural and functional aspects of different biomolecules. The Biochemistry provides a foundation for careers in medicine, biotechnology, or research in all branches of the biological sciences.	
8	Outline syllabus		CO Mapping
	Unit 1	**Carbohydrate metabolism**	
	A	Structure and Classification of carbohydrates	CO1, CO2
	B	Glycolysis and TCA cycle	
	C	Electron Transport chain	
	Unit 2	**Lipids- structure and metabolism**	
	A	Function of lipids	
	B	Classification of lipids	CO1, CO3

	C	Beta oxidation of fatty acids and Ketone bodies			
	Unit 3	**Amino acids and Proteins**			
	A	Structure and classification of amino acids			CO1 and CO4
	B	Levels of protein structure			
	C	Function of proteins			
	Unit 4	**Purines and Pyrimidines**			
	A	Purines and Pyrimidines			CO1 and CO5
	B	Nucleosides and nucleotides			
	C	DNA and RNA structure			
	Unit 5	**Vitamins**			
	A	Function of Vitamins			CO1 and CO6
	B	Types of Vitamins			
	C	Disorders related to vitamin deficiency			
	Mode of examination	**Theory**/Jury/Practical/Viva			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	David L Nelson, Michael M Cox, "Principles of Biochemistry" W. H. Freeman; Seventh edition Jan, 2019.			
	Other References	2. Biochemistry by Voet and Voet, Wiley New York, April 2012. 3. Biochemistry by Stryer, W. H. Freeman, 2019			

COURSE ARTICULATION MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BTY235.1	2	2	-	1	-	2	-	-	-	-	-	-	-	-	-	-
BTY235.2	3	2	-	2	-	-	-	-	-	3	-	1	-	-	-	-
BTY235.3	3	2	2	2	2	2	-	1	-	-	-	2	2	3	-	2
BTY235.4	2	2	-	2	-	-	-	-	3	-	-	-	-	-	-	
BTY235.5	2	3	3	2	3	3	-	-	-	-	2	2	3	3	-	3
BTY235.6	2	3	2	3	1	3	-	-	-	-	-	2	2	1	-	-

CBI201: Advance Concepts of Bioinformatics

School: SET		**Batch: 2019-23**	
Program: B. Tech		**Current Academic Year: 2021-22**	
Branch: Biotechnology		**Semester: Odd (5th)**	
1	Course Code	CBI201	
2	Course Title	**Advance Concepts of Bioinformatics**	
3	Credits	2	
4	Contact Hours (L-T-P)	2-0-0	
	Course Status	**Compulsory**/Elective/Open Elective	
5	Course Objective	1. To acquire an advanced knowledge of bioinformatics tools used for designing and analyzing *in silico* experiments and different techniques used for molecular modeling. 2. This course surveys a wide range of biological databases and their access tools and enables students to develop proficiency in their use. 3. The course also focuses on the design of biological databases and examines issues related to heterogeneity, interoperability, complex data structures, object orientation and tool integration.	
6	Course Outcomes	After successfully completion of this course students will be able to: CO1: Students will be able to understand about fundamental of bioinformatics and also having insight about various databases and tools. CO2: Students will have basic knowledge about information molecules (DNA, RNA and proteins), their structure and functions. CO3: Develop computing tools for analyzing various kinds of biological and experimental data, data mining from databases, computer simulation of living systems and so on. CO4: Will gain knowledge about various alignment tools and their applications. CO5: Will gain knowledge about gene, genome and genome analysis. CO6: Overall knowledge about basic computational biology and their applications in biotechnology.	
7	Course Description	1. Analyze sequence similarity search using BLAST. 2. Examine phyolgenetic relationship using clustal and parsimony. 3. Assess motif consensus by Markov model. 4. Identify regulatory sequence by Meme. 5. Determine structure of biomolecules by software (Pymol, Rasmol) and database. 6. Compute structure of biomolecules using modeling and docking. 7. Perform microarray and protein array analysis for drug target identification and gene prediction.	
8	Outline syllabus		CO Mapping
	Unit 1	**Bioinformatics and Databases**	
	A	Introduction to bioinformatics	CO1, CO6

	B	Scope and importance	CO1, CO6
	C	Major bioinformatics databases and tools	CO1, CO6
	Unit 2	**Information Molecules and Sequence Analysis**	
	A	Information molecules, Information Flow and DNA sequencing, Protein structure, functions and protein folding, Nucleic acid protein interaction	CO2, CO6
	B	BLAST	CO2, CO6
	C	Sequence assembly, Clustal, phylogenetics: distance based approaches, parsimony	CO2, CO6
	Unit 3	**Data Storage and Analysis**	
	A	File Format (Genbank, DDBJ, FASTA, PDB, SwissProt)	CO3, CO6
	B	Introduction to Metadata; File Storage; Boolean Search and Fuzzy Search	CO3, CO6
	C	Representation of molecular structures (DNA, mRNA, protein), secondary structures, domains and motifs	CO3, CO6
	Unit 4	**Sequence Alignments and Analysis**	
	A	Sequence alignment	CO4, CO6
	B	Global and Local alignment, Pairwise alignment and Multiple sequence alignment	CO4, CO6
	C	Phlylogenetic tree analysis	CO4, CO6
	Unit 5	**Gene , Genome and Analysis**	
	A	Structure of Prokaryotic and Eukaryotic gene; DNA and genome sequencing Motif and consensus	CO5, CO6
	B	Gene finding: composition based finding	CO5, CO6
	C	Sequence motif-based finding	CO5, CO6
	Mode of examination	Theory/Jury/Practical/Viva	
	Weightage Distribution	CA: 30% / MTE: 20% / ETE: 50%	
	Text book/s*	1. Lesk A., *Introduction to Bioinformatics, 3rd Edition.* Oxford University Press (2008). 2. Dan E. Krane and Michael L. Raymer., *Fundamental Concepts of Bioinformatics, 3rd Edition*, Pearson Education (2009). Xiong J., *Essential Bioinformatics.* Cambridge University Press (2006).	
	Other References	NA	

COURSE ARTICULATION MATRIX

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
BTY321.1	2	2	-	1	-	2	-	-	-	-	-	-	-	-	-	-
BTY321.2	3	2	-	2	-	-	-	-	-	3	-	1	-	-	-	-

BTY321.3	3	2	2	2	2	2	-	1	-	-	-	2	2	3	-	2
BTY321.4	2	2	-	2	-	-	-	-	3	-	-	-	-	-	-	
BTY321.5	2	3	3	2	3	3	-	-	-	-	2	2	3	3	-	3
BTY321.6	2	3	2	3	1	3	-	-	-	-	-	2	2	1	-	-

B.Tech-CSE with specialization in Business Analytics & Optimization

	Course Code	**CBA 201**
2	Course Title	Applied Statistical Analysis
3	Credits	**(3-0-0) 3**
4	Contact Hours	
5	Course Objective	The course enables students to 1. Learn how to analyze statistical data properly. 2. Understand the role of formal statistical theory and informal data analytic methods.
6	Course Outcomes	1.The students will be able to 2.Gain an understanding of statistical methods relevant to upper division interdisciplinary courses. 3.Sharpen students' statistical intuition and abstract reasoning as well as their reasoning from numerical data through community-based and other research.
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	Introduction to Statistical Analysis
8.02	Unit A Topic 1	Introduction, Meaning of Statistics, The Scietific Method, Basic Steps of the Research Process, Experimental Data and Survey Data,
8.03	Unit A Topic 2	Populations and Samples, Census and Samling Method, Parameter and Statistic, Independent and Dependent Variables
8.04	Unit A Topic 3	Examining Relationships, Introduction to SPSS Statistics.
8.05	Unit B	Describing Data
8.06	Unit B Topic 1	Introduction, Types of Data, Data Transformation, Summarizing Data: Graphical Methods, Summarizing Data:
8.07	Unit B Topic 2	Measures of Central Tendency, Summarizing Data: Measures of Dispersion, Levels of Measurement, Randon Variables and Probability Distributions, Discrete and Continuous Random Variable,
8.08	Unit B Topic 3	Making Inferences about Populations from samples, Estimator and Estimate, Confidence Interval for Population Mean (Large Sample).
8.09	Unit C	Testing Hypothesis
8.10	Unit C Topic 1	Introduction, Null and Alternative Hypothesis, Type I and Type II Error, The Procedure of Hepothesis Testing, Hypothesis Testing of a Population Mean: Large Sample, Hypothesis Testing of a Population Mean: Small Sample,
8.11	Unit C Topic 2	Hypothesis Test of a Proportion (One Sample), Hypothesis Test of Population Variance, Hypothesis Test of Population Mean: Two Independent Samples(), Hypothesis Test of Population Mean:

8.12	Unit C Topic 3	Dependent Samples (Paired Samples), Hypothesis Test about Two Population Proportion, Hypothesis Teest about Two Population Variances, Analysis of Variance (ANOVA), Nonparametric Test, Sign Test for Paired Data, Wilcoxon Matched Pairs Signed Ranks Test (for n>10 pairs), Mann-Whitney U Test, Kruskal-wallis Tests (H Test).
8.13	Unit D	Examining Relationships
8.14	Unit D Topic 1	Introduction, Types of Correlation, Karl Pearson Coefficient Correlation, Spearman's Rank Order Correlation, Partial Correlation,
8.15	Unit D Topic 2	Residuals and Plots, Simple Linear Regression, Multiple Regression Model, Repeated Measures, Non-linear Regression
8.16	Unit D Topic 3	, Polynomial Regression Models, Weighted Least Squares, Two Stage Least Squares 1, Structural Equation Modeling.
8.17	Unit E	Advanced Techniques
8.18	Unit E Topic 1	Identifying Groups: Classification, Probit Analysis, Discriminant Function Analysis,
8.18	Unit E Topic 2	Proportional Odds Models, Decision Trees, Neural Networks, Cluster Analysis
8.20	Unit E Topic 3	, Factor Analysis, Multidimensional Scaling.

9	**Reading Content**	
9.1	Text book*	21. Advanced Statistical Analysis (IBM ICE Publication)
9.2	other references	3. Statistical Data Analysis (Oxford Science Publications) by Glen Cowen 4. Statistical Analysis : an Introduction using R.Wikibooks 5. Multivariate Statistical Analysis A Conceptual Introduction, 2nd edition by Sam Kash Kachigan 6. Handbook of Statistical Analysis and Data Mining Application by Robert Nisbet, John, IV Elder, Gary Miner

	Course Code	**CSE 450**
2	Course Title	**Big Data Analytics**
3	Credits	**(2-0-0) 2**
4	Contact Hours	
5	Course Objective	**To work with unconventional & unstructured data sources like Web server logs, Internet click stream data, social media activity reports, mobile-phone call detail records and information captured by sensors to produce analytics.** **2. To understand and use the technologies associated with big data analytics including NoSQL databases, Hadoop and MapReduce.** **3. To practice big data operations on IBM Big Insight platform.**
6	Course Outcomes	**1. Understand and appreciate the use-cases & architectural considerations for big data analytics implementation.** **2. Learn best practices to extend data warehousing with Hadoop and other big data technologies across business operations and industries to enable big data analytics.**
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	**Big Data Concepts**
8.02	Unit A Topic 1	What Is Big Data, Volume, Velocity, and Variety; Why Its Important
8.03	Unit A Topic 2	, Risks Of Big Data, Need Of Big Data, Structure Of Big Data; Exploring Big Data
8.04	Unit A Topic 3	, Filtering Big Data, The Need For Standards; Big Data and Analytics, Adoption Architecture, Benefits & Barriers, Trends for Big Data Analytics
8.05	Unit B	**Hadoop Fundamentals**
8.06	Unit B Topic 1	Hadoop Architecture, Hadoop File System (HDFS); HDFS Administration;
8.07	Unit B Topic 2	Map / Reduce concepts; Setup of an Hadoop Cluster ; Managing Job Execution ;
8.08	Unit B Topic 3	move data into Hadoop using Flume, Data Loading ; Overview of workflow engine
8.09	Unit C	**Query languages for Hadoop**
8.10	Unit C Topic 1	Jaql basics, Jaql data types, Input/output with Jaql,
8.11	Unit C Topic 2	working with operators and expressions,
8.12	Unit C Topic 3	Use of Pig & Hive
8.13	Unit D	**Hadoop Reporting and Analysis**
8.14	Unit D Topic	Approaches to Big Data reporting and analysis

	1	
8.15	Unit D Topic 2	, Big Data Access Technologies for Reporting and Analysis.
8.16	Unit D Topic 3	, Business Intelligence and Hadoop Architecture, Direct Batch Reporting on Hadoop, Live Exploration of Big Data, Indirect Batch Analysis on Hadoop
8.17	Unit E	**Analytics for Big Data at Rest & in Motion**
8.18	Unit E Topic 1	Data Stream overview; Streams Processing Language Basics; Streams Processing Language Development ;
8.18	Unit E Topic 2	SPL Programming Introduction ; Adapter Operators ; Relational and Utility Operators - The Journey Begins ; Relational and Utility Operators (continued) ; Windowing and Joins ; Punctuation, aggregation and Sorting
8.20	Unit E Topic 3	; Timing and Coordination ; Lists, Sets, and Maps ; Nodes and Partitions ; Debugging; Adapters and Toolkits

10	**Reading Content**	
9.1	Text book*	**Big Data Analytics (IBM ICE Publications)**
9.2	other references	

	Course Code	**CSE305**
2	Course Title	**Business Intelligence**
3	Credits	**(3-0-0) 3**
4	Contact Hours	
5	Course Objective	**Learn the basics of Business Intelligence.** **• Learn dashboards design by utilizing key performance indicators that managers can use to improve day-to-day business operations.** **• To learn how to plan and implement BI development projects.** **• To know the administrative and deployment scenarios & issues in BI space.**
6	Course Outcomes	**Understand & appreciate the use of analytical skills and business principles in operational and strategic decision-making by means of BI.** **• Design and develop dashboards.** **• Learn the best practices to work on BI projects.** **• Use IBM Cognos BI tool to develop, implement and administrate wide range of BI artifacts.**
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	**Introduction to Business Intelligence**
8.02	Unit A Topic 1	Business Intelligence (BI), Scope of BI solutions and their fitting into existing infrastructure, BI Components and architecture, BI Components, Future of Business Intelligence, SaaS and Cloud computing techniques, Functional areas of BI tools, End user assumptions
8.03	Unit A Topic 2	, Setting up data for BI, Data warehouse, OLAP and advanced analytics, Supporting the requirements of senior executives including performance management,
8.04	Unit A Topic 3	Glossary of terms and their definitions specific to the field of BI and BI systems.
8.05	Unit B	**Elements of Business Intelligence Solutions**
8.06	Unit B Topic 1	Business Query and Reporting, Reporting,).
8.07	Unit B Topic 2	Dashboards and Scorecards Development, Development, Scorecards,
8.08	Unit B Topic 3	Metadata models, Automated Tasks and Events, Mobile Business Intelligence, Software development kit (SDK)
8.09	Unit C	**Building BI Project**
8.10	Unit C Topic 1	Stages of Business Intelligence Projects, Project Tasks
8.11	Unit C Topic 2	, Risk Management and Mitigation, Cost justifying BI solutions and measuring success.

8.12	Unit C Topic 3	, BI Design and Development
8.13	Unit D	**Report Authoring**
8.14	Unit D Topic 1	Building Reports, Building a Report ,
8.15	Unit D Topic 2	Drill-up,
8.16	Unit D Topic 3	Drill-down Capabilities.
8.17	Unit E	**BI Deployment, Administration and Security**
8.18	Unit E Topic 1	Centralized versus Decentralized Architecture, Phased and Incremental BI road map, Setting early expectations and measuring the results, EPM (Enterprise performance Management.
8.18	Unit E Topic 2	), End-User Provisos, OLAP Implementation, Implementation, Data Warehouse Architecture, Predictive Analysis, Text Mining , Authentication, Authorization, Access Permissions,
8.20	Unit E Topic 3	Group and Roles, Single Sign-on (SSO), Data Backup and Restoring

10	**Reading Content**	
9.1	Text book*	
9.2	other references	

	Course Code	**CSE 306**
2	Course Title	Data Warehouse & Multidimensional Modeling
3	Credits	**(3-0-0)3**
4	Contact Hours	
5	Course Objective	The course enables students to 1.Understand the fundamentals of Data Warehousing 2. Learn modelling of datawarehousing 3. Understand the concepts of Multi-Dimensional Modeling and learn the Methodology 4. Learn Non-Temporal Design of R-OLAP 5. Learn Non-Temporal Design of M-OLAP.
6	Course Outcomes	The students will be able to Have understood the fundamental conceppts of data warehousing • Develop a model for datawarehousing • Do multidimensional modelling of datawarehousing. • Design R-OLAP • Design M-OLAP
7	**Prerequisite**	
8		
8.01	Unit A	Introduction to Data Warehousing
8.02	Unit A Topic 1	Data Warehouse Architectures
8.03	Unit A Topic 2	, A perspective on decision support application
8.04	Unit A Topic 3	
8.05	Unit B	Data Warehousing and Modeling
8.06	Unit B Topic 1	An Introduction to Data Warehouse Modeling,
8.07	Unit B Topic 2	Differentiating the Warehousing model from the OLTP model,
8.08	Unit B Topic 3	Warehouse Modeling Approaches, OLAP – OnLine Analytical Processing, Basic OLAP Operations.
8.09	Unit C	Multi-Dimensional Modeling – Methodology
8.10	Unit C Topic 1	Requirement Analysis, Requirements modeling,
8.11	Unit C Topic 2	Terminologies in a Multi-dimension Model
8.12	Unit C Topic 3	, Multi-Dimensional Model Structures, Solution Validation Techniques, Detailed Dimension Modeling.
8.13	Unit D	Non-Temporal Design - R-OLAP
8.14	Unit D Topic 1	R-OLAP and its design techniques, Design techniques of an R-OLAP System,

8.15	Unit D Topic 2	Dimension-Oriented Design techniques, Fact-oriented Design Techniques, Utilize Cubing Services to improve R-OLAP and M-OLAP performance,
8.16	Unit D Topic 3	Cubing Services performance and scalability, Scalability, Cubing Services security, Role-based security in Cubing Services.
8.17	Unit E	Non-Temporal Design - M-OLAP
8.18	Unit E Topic 1	IBM Cognos Architecture, Sparse and Dense Dimensions –
8.18	Unit E Topic 2	with Hyperion Essbase, MOLAP characteristics
8.20	Unit E Topic 3	, Online Data Analysis MOLAP and ROLAP

9	**Reading Content**	
9.1	Text book*	22. Data Warehouse & Multidimensional Modeling (IBM ICE Publication)
9.2	other references	7. Data Warehousing and Mining :Concepts, Methodologies, Toolls and Applications (Vol I to VI) by John Wang • The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling, 3rd Edition by Ralph Kimball and Margy Ross • Open Source Data Warehousing and Business Intelligence by Lakshman Bulusu Auerach Pulications • Data Min ing and Data Warehousing by Bharat Bhushan Agarwal and Sumit Prakash ,Tayal Laxmi Publications.

	Course Code	**CSE 453**
2	Course Title	**Social, Web & Mobile Analytics**
3	Credits	**(3-0-0) 3**
4	Contact Hours	
5	Course Objective	**To learn the Social, Web and Mobile analytics.** **• To learn data, KPIs/metrics** **• To manage the Social & Web media with analytics** **• To understand email marketing** **• To understand mobile analytics for content Publishers & operators.**
6	Course Outcomes	**Students would be able to – gain good knowledge of Social, Web & Mobile Analytics**
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	**Introduction to Web & Social Analytics**
8.02	Unit A Topic 1	Overview of web & social media. Need of using analytics, Web analytics technical requirements. Social media environment
8.03	Unit A Topic 2	, Impact of social media on business, how to leverage social media for better services,
8.04	Unit A Topic 3	current analytics platforms, Open source vs licensed platform, choosing right specifications & optimal solution.
8.05	Unit B	**Relevant Data & its collection, KPIs/ metrics**
8.06	Unit B Topic 1	Participating with people centric approach, organizing for social media, choosing focused Data sources & Social networks, collecting and understanding social media data, leverage qualitative data by understanding what, why and how much, usability alternatives, web enabled emerging user research, online surveys
8.07	Unit B Topic 2	Understand the discipline of social analytics, Aligning social objectives with business goals, Identify common social business objectives, developing KPIs; Standard vs Critical metrics. Bounce rate, exit rate, conversion rate, engagement, strategically aligned KPIs, Tactics to find out best web and social media metrics;
8.08	Unit B Topic 3	Moving from strategy to execution, Build scorecards & dashboards to track KPIs. Measuring Macro & micro conversions, Quantify Economic value, measuring success for non- ecommerce and B2B websites
8.09	Unit C	**Manage Web & Social media with Analytics, Future of Social Media Analytics and Monitoring**
8.10	Unit C Topic 1	Explore & evaluate - Dashboard, Relationships, Sentiments, Evolving Topics, Reports, Content creation & tracking, Competitive Intelligence analysis, website traffic analysis, search & keyword analysis

8.11	Unit C Topic 2	, audience identification & segment analysis, Optimizing social media strategy, Social media enablement audit, Understand signals and potential.
8.12	Unit C Topic 3	Mashing Up Data from Disparate Sources; Integrate solution to share outcome with others
8.13	Unit D	**Introduction to Mobile Analytics, Mobile Customer Experience Management**
8.14	Unit D Topic 1	mobile analytics, Basics of mobile computing – Smart phones, mobile browsers, Mobile applications, Bandwidth, transactions, sessions, handset types & operating systems, mobile operators & their services, WAP gateway or GGSN support, APNs or regional POPs support, Architecture components , mobile web-services, overview of mobile cloud. .
8.15	Unit D Topic 2	Mobile as next customer experience frontier, Customers expectations, business impact & criticality, Core metrics for deeper behavior analysis, Integration of different channels – SMS, Instant massaging, chatting, apps, HTML5 enabled sites on browsers for unique experience,
8.16	Unit D Topic 3	Multi-chennal campaning optimization, considerations for best mobile services, Location based media & support
8.17	Unit E	**Mobile Analytics for Content Publishers & Operators,e-mail marketing, Data Functionalities**
8.18	Unit E Topic 1	Mobile Handset Analysis, Mobile Handset Screen Resolution - supported screen resolutions of mobile handsets browsing site in terms of page views, visits and visitors, Mobile Operator Analysis - operator names and countries of subscribers browsing your site in terms of page views, visits and visitors.
8.18	Unit E Topic 2	The types of statistics & reports --Bandwidth (total, average per visit, total per file type), Transactions (average per visit, number of downloads, page view breakdown), Sessions (entry page, average duration, click paths, referring search engine), Subscribers (browser type, user agent, operating system), Operating system (iOS, Android, Blackberry, etc), Mobile applications (YouTube, Facebook, Twitter, etc), Content categorisation (Adult, Video, Social, Ad Networks, etc), Handsets (make, model, screen resolution
8.20	Unit E Topic 3	Mobile Operator (country of origin, operator name), Geo Location (Visitor location tracking, country of origin, RDNS lookup)Referrer tracking, Search term performance, Specific visitor behaviour, Page views per visit by referrer/advert, Time spent on site by referrer/advert. **E**Logs users email address, Cold callers report. Page views per annum, Data recording timeframe, Data archiving timeframe, Historic comparison, Integration to client platforms through API, HTTPS Support

10	**Reading Content**	
9.1	Text book*	**Social, Web and Mobile Analytics**
9.2	other references	

B.Tech-CSE Cloud Computing & Virtualization

	Course Code	**CSE 308**
2	Course Title	**Backup & Disaster Recovery**
3	Credits	**(2-0-0)2**
4	Contact Hours	
5	Course Objective	**The course should enable the students to - Understand Data backup and storage, High Availability and Disaster Recovery**
6	Course Outcomes	**The student should be able to – Gain knowledge of Data backup and storage, High Availability and Disaster Recovery**
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	**Fundamentals of Backup**
8.02	Unit A Topic 1	Disk Storage, Characteristics Of A Disk Drive, Types Of Disk Drives, Access Centric Drives, Capacity Centric Drives, Disk Systems, Tape, Specifications Of Lto-6, Worm,
8.03	Unit A Topic 2	Automated Tape Library, Backup, Recovery Objectives , Rpo: Recovery Point Objective, Rto: Recovery Time Objective, Types Of Backup, Full Backup, Incremental Backup,.
8.04	Unit A Topic 3	Differential Backup, Progressive Incremental Backup, Architectures Of Backup, Network Based Backup, Disk To Disk To Tape (d2d2t) Backup, Network Free (san) Backup, Server Free Or Server Less Backup, Network Data Management Protocol (ndmp) Backup, Virtual Tape Library, Archive
8.05	Unit B	**High Availability**
8.06	Unit B Topic 1	Overview Of High Availability, High Availability, Reliability, Serviceability & Availability, Need Of Availability, Terminologies,
8.07	Unit B Topic 2	Components That Affect Availability & The Need For High Availability,
8.08	Unit B Topic 3	Availability Levels And High Availability, How High Availability Can Be Achieved, Single System
8.09	Unit C	**Fault Tolerance**
8.10	Unit C Topic 1	, Fault Tolerant, Redundant Components, Monitoring, Alerting And Notification, Hot Swap And Hot Plug, High Availability Clustering, High Availability Components, Types Of Ha Solutions, Ha Clustering Advantages, High Availability Criteria, Network Layer High Availability
8.11	Unit C Topic 2	, Hardware Combinations And Ha Possibilities, Application & Operating System Layer, Hardware Layer: Storage, High Availability For Virtual Environments.
8.12	Unit C Topic	, Components Of A Virtual Machine, High Availability On Virtual

	3	Machines
8.13	Unit D	**Disaster Recovery**
8.14	Unit D Topic 1	Introduction, Disaster Recovery, Types Of Disasters, Business Continuity (bc) And Disaster Recovery (DR), Importance Of Disaster Recovery, DR Terminologies, Quantitative Terminologies
8.15	Unit D Topic 2	, Availability Terminologies, Networking / Communication Terminologies, Location Designations, Disaster Recovery Planning, Phases Of Planning,
8.16	Unit D Topic 3	Getting Acceptance, Form A DR Team, Agree On The Recovery Service Levels, Plan A DR Strategy, Implement The Strategy, Plan The Test And Test The Plan,
8.17	Unit E	**DR Technology**
8.18	Unit E Topic 1	DR Technology Tree, High Availability, Virtualization, Replication, Local Replication,
8.18	Unit E Topic 2	Remote Replication, Replication Tools, Deployment Topologies,
8.20	Unit E Topic 3	Two Site Replication, Multi-site Replication, DR Drill And The DR

10	**Reading Content**	
9.1	Text book*	**Backup & Disaster Recovery** (IBM ICE Publication) 23.
9.2	other references	8.

	Course Code	**CSE 309**
2	Course Title	**Cloud Computing Architecture & Deployment Models**
3	Credits	**(3-0-3)3**
4	Contact Hours	
5	Course Objective	**The course enables students to** • To learn cloud computing delivery model IaaS, • To learn cloud computing delivery model PaaS, • To learn cloud computing delivery model SaaS • To learn Public cloud deployment model, • To learn Private cloud deployment model, • To learn Hybrid cloud deployment model.
6	Course Outcomes	**The students will be able to** • Understand Cloud delivery models in details • Understand briefly Cloud Computing Reference Architecture. • Understands Cloud deployment models in details e.g., Public, Private and Hybrid.
7	**Prerequisite**	
8		
8.01	Unit A	**Overview of Delivery models in Cloud Computing**
8.02	Unit A Topic 1	Cloud Computing Platform Overview, Why Cloud Computing?, Evolution of Cloud Computing, What is Cloud Computing?, Cloud Computing Definition and Characteristics, Definition of Cloud Computing, Essential characteristics of Cloud Computing,
8.03	Unit A Topic 2	Types of Cloud, Cloud Computing Advantages, Illustration of the benefits of cloud computing , Cloud Computing Challenges, Illustration of cloud computing challenges, Cloud Computing Service models, Cloud Computing Deployment models, Cloud Service and Deployment models, Cloud adoption considerations, Cloud adoption.
8.04	Unit A Topic 3	Cloud History – Internet technologies (SOA, Web Services, Web 2.0, mashups), Distributed computing – Utility and Grid Computing, Hardware – VMWare ESXi, Xen, KVM; Virtual Appliances and the open Virtualization format; System Management; Anatomy of Cloud; Benefits of Cloud; Cloud Transformation roadmap; cloud delivery models and their advantages; Cloud computing architecture.
8.05	Unit B	**IaaS, PaaS and SaaS**
8.06	Unit B Topic 1	Introduction to Infrastructure as a Service delivery model, characteristics of IaaS, Architecture, examples of IaaS, Applicability of IaaS in the industry , Comparing ISPs and IaaS, Motivations for renting the infrastructure; IaaS Case studies; IaaS enabling Technology; Trusted cloud. Introduction to Platform as a Service delivery model, characteristics of PaaS,
8.07	Unit B Topic 2	patterns, architecture and examples of PaaS, Applicability of PaaS in the industry ; Integrated Lifecycle Platform; Anchored Lifecycle platform; Enabling Technologies as a Platform; PaaS – best option or not.

		Introduction to Software as a Service delivery model, characteristics of SaaS, SaaS Origin; Evolvement of
8.08	Unit B Topic 3	SaaS – Salseforce.com's approach; SaaS Economics and Ecosystem; Types of SaaS Platforms; Architecture, SaaS – Providers; Collaboration as a Service; Enabling and Management tools as a Service; Applicability of SaaS in the industry.
8.09	Unit C	**Cloud Computing Reference Architecture (CCRA)**
8.10	Unit C Topic 1	Introduction to Cloud computing reference architecture (CCRA), benefits of CCRA, Architecture overview – The conceptual Reference Model; Cloud Consumer; Cloud provider; Cloud Auditor; Cloud carrier; Scope of control between Provider and Consumer; CCRA
8.11	Unit C Topic 2	: Architectural Components – Service deployment , Service Orchestration, Cloud Service Management, Security; Cloud Taxonomy;
8.12	Unit C Topic 3	IBM's Cloud Computing Reference Architecture(CCRA 2.0) – Introduction, roles, Architectural elements; CCRA evolution; Examples of Cloud Services; versions and application of CCRA for developing clouds.
8.13	Unit D	**Private, Public and Hybrid Cloud Deployment Models**
8.14	Unit D Topic 1	What is a Private Cloud?, Illustration of Private Cloud, Advantages of Private Cloud, Limitations of Private Cloud, Service Management, Journey into Private Cloud, Planning and Strategy, Standardization, Virtualization, Automation, Cloud, Case study – VMware vCloud, Case Study – IBM SmartCloud Entry, Private cloud. What is a Public Cloud?, Illustration of Public Cloud, Why Public Cloud, Advantages of Public Cloud, Limitations of Public Cloud
8.15	Unit D Topic 2	, Low degree of security and control, Lack of control on infrastructure, configuration, Network latency and accessibility concerns, Highest long term cost, Public v/s Private, Journey into Public Cloud, Revisit the idea of adopting public cloud, Cloud vendor selection, Migrating to Cloud, Cloud vendor selection, SLA – Service Level Agreements, Credits/Compensation terms, Credit process, Disaster recovery plan, Exclusions, Security and Privacy, Periodic upgrade and maintenance, Data location and Jurisdiction, Pricing and Measurability, Interoperability and Lock-in, Exit process/Termination policies, Proven track record, Public cloud vendors, Case studies
8.16	Unit D Topic 3	. What is a Hybrid Cloud?, Why Hybrid Cloud, Illustration of Hybrid Cloud, Advantages of Hybrid Cloud, Challenges of Hybrid Cloud, Develop and manage hybrid workloads, Developing applications for hybrid cloud, Develop applications using PaaS, Managing hybrid workloads, Journey into Hybrid Cloud, Step 1: Asses current IT infrastructure and business, Step 2: Explore cloud computing, Step 3: Create cloud deployment strategy plan, Step 4: hybrid cloud implementation.
8.17	Unit E	**Cloud Computing Platform Lab**
8.18	Unit E Topic	OpenStack Introduction, OpenStack Architecture

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8.18	Unit E Topic 2	, Lab Environment, Hardware requirements,.
8.20	Unit E Topic 3	Software requirements, High level overview of setup

10	**Reading Content**	
9.1	Text book*	**Cloud Computing Architecture & Deployment Models** (IBM ICE Publication)
9.2	other references	1.Developing and Hosting Applications on the Cloud (July, 2012), Alex Amies, Harm Sluiman, Qiang Guo Tong, Guo Ning Liu 2 IBM Cloud Computing http://www.ibm.com/cloud-computing/us/en/ 3. Wikipedia page on Cloud Computing http://en.wikipedia.org/wiki/Cloud_computing

	Course Code	**CSE 215**
2	Course Title	Introduction to IT infrastructure Landscape
3	Credits	**(3-0-0)3**
4	Contact Hours	
5	Course Objective	The course enables students to • To understand the Database, Application and Middleware along with System Server hardware and Directory Services
6	Course Outcomes	On successful completion of this module students will be able to: The students will be able to • Gains good knowledge of Database, Application and middleware software along with System Hardware and networking.
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	**Database Overview**
8.02	Unit A Topic 1	Understanding Database types, Database Terminology, Characteristics Of Databases, Introduction To Database Management Systems, Types Of Database Management Systems, Database Security And Recovery, Data Mining, Data Warehousing, And Data Marts, Data Mining (DM), Data Warehousing and Data Marts, SQL Overview , Introduction to SQL, History of SQL,
8.03	Unit A Topic 2	Relational database schema, Data Types, Dates and Times, Creating a table, Default Values, NULL values, Constraints, Referential integrity, Creating a schema, Creating a view, Creating other database objects, Modifying database objects, Renaming database objects, Data manipulation with SQL, Selecting data, Ordering the result set, Cursors, Inserting data, Deleting data, Updating data, Table joins, Inner joins , Equi-join, Natural join, Cross join, Outer joins, Left outer join, Right outer join, Full outer join, Union.
8.04	Unit A Topic 3	, intersection, and difference operations, Union, Intersection, Difference (Except), Relational operators, Grouping operators, Aggregation operators, HAVING Clause, Sub-queries, Sub-queries returning a scalar value, Sub-queries returning vector values, Correlated sub-query, Sub-query in FROM Clauses, Mapping of object-oriented concepts to relational concepts, JDBC, What is JDBC?, JDBC Architecture:, Common JDBC Components: Database APIs, ODBC and the IBM Data Server CLI driver, Indexes , Clustered And Non-clustered Indexes, Failure Management With Db2 Cluster Services
8.05	Unit B	**Storage Overview**
8.06	Unit B Topic 1	Storage Networking Technology,
8.07	Unit B Topic 2	Types Of Storage System, FC-AL (Fibre Channel Arbitrated Loop),
8.08	Unit B Topic	Fabric, Storage Area Network, Zoning, Storage Virtualization.

	3	
8.09	Unit C	**Systems & Directory Services Overview**
8.10	Unit C Topic 1	Server Technology, Operating System, Virtualization, Hypervisor, I/o Virtualization, Partitioning, Server Deployment, Server Management Console
8.11	Unit C Topic 2	, Server Availability Concepts And Techniques, Server Workload. Directory Server Concepts, Directory, LDAP PROTOCOL, Overview of LDAP, LDAP Architecture,
8.12	Unit C Topic 3	LDAP Models, LDAP Replication Topologies, LDAP Data Interchange Format (LDIF).
8.13	Unit D	**Network Security and Overview**
8.14	Unit D Topic 1	Network Overview, Network Topologies, Tree Topology, Firewalls
8.15	Unit D Topic 2	, Switching Concepts , What Is Routing? , Virtual Lan's, Security Basics, Loss Of Privacy,
8.16	Unit D Topic 3	Loss Of Integrity, Security Technology, Active Audit , Secure Messaging, Data Security, Network Security
8.17	Unit E	**Application and Middleware Overview**
8.18	Unit E Topic 1	Introduction To Common Messaging System (MQ SERIES), Application Integration – Business Need, Middleware, Message Oriented Middleware, Synchronous interaction
8.18	Unit E Topic 2	, Asynchronous interaction, Coupling, Reliability, Scalability, Availability, IBM Websphere MQ, Websphere MQ Objects, Web Tier Deployment, Application Servers And Clustered Deployment, EMAIL, Lotus Architecture, Lotus Domino Server Types, Lotus Notes Clients
8.20	Unit E Topic 3	, Types of Certificates, DATA WAREHOUSING, Warehouse Modeling Approaches , Basic Concepts, Dimension, Basic OLAP Operations.
Note :		
10	**Reading Content**	
9.1	Text book*	24. **Introduction to IT infrastructure Landscape** (IBM ICE Publication)
9.2	other references	

	Course Code	**CSE 464**
2	Course Title	**Security in Cloud**
3	Credits	**(3-1-0)4**
4	Contact Hours	
5	Course Objective	**The course should enable the students to** **• To learn the security, system & program threats** **• To learn security risks and addressing the security risk** **• To learn encryption and decryption**
6	Course Outcomes	**The student should be able to gain** **• Knowledge of security, system and program threats** **• Security risk knowledge** **• Knowledge of decryption and encryption**
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	**Security Overview**
8.02	Unit A Topic 1	Security Overview, Operating System – Security, Authentication, One Time passwords, Program Threats, System Threats,
8.03	Unit A Topic 2	Computer Security Classifications, Application Security, Application Code Review, Secure Developer Training, Data Center Security
8.04	Unit A Topic 3	, Security – Cloud Computing, Security Framework, Architecture Principles, System Management Components.
8.05	Unit B	**Understanding Security Risks**
8.06	Unit B Topic 1	Understanding Security Risks, Understanding security risks, Identifying the biggest risks, Cloud computing - Working definition , Top security benefits, Top security risks, Security benefits of cloud computing, Security and the benefits of scale, Risks, Virtualization, Overview, Hypervisor, I/O Virtualization, Partitioning, Server Deployment, Virtual Server Deployment , What is a Tenant?, Defining Multi-Tenancy, Securing the Multi-Tenant Environment, Vulnerability: An Overview, Defining Vulnerability
8.07	Unit B Topic 2	, Vulnerabilities and Cloud Risk, Cloud Computing, Core Cloud Computing Technologies , Essential Characteristics, Cloud-Specific Vulnerabilities, Core-Technology Vulnerabilities, Essential Cloud Characteristic Vulnerabilities, Defects in Known Security Controls, Prevalent Vulnerabilities in State-of-the-Art Cloud Offerings, Architectural Components and Vulnerabilities, Internal Security Breaches
8.08	Unit B Topic 3	, Cloud Software Infrastructure and Environment, Computational Resources, Storage, Communication, Cloud Web Applications, Services and APIs, Management Access, Identity, Authentication, Authorization, and Auditing Mechanisms, Provider, Data Corruption, User account and Server Hijacking, How to Secure Your Cloud..
8.09	Unit C	**Addressing security risks in cloud**
8.10	Unit C Topic	Introduction, Core Components of AAA.

	1	
8.11	Unit C Topic 2	, Example AAA Flow, Authorization Approaches
8.12	Unit C Topic 3	, Accounting Techniques
8.13	Unit D	**Identity Management**
8.14	Unit D Topic 1	Identity management, Isolated identity management, Federated identity management, Centralized identity management, Authentication and Authorization.
8.15	Unit D Topic 2	, Challenges of Identity Management, Identity Theft, Identity Management Adoption and Benefits, Benefits of Identity Management, Conclusion, Evolution of IAM — moving beyond compliance, Identity access Management life cycle phases, IAM and IT trends, Mobile computing, Cloud computing, Data loss prevention, Social media, IAM and cyber crime, Case study
8.16	Unit D Topic 3	— IAM in practice, Transforming IAM, Life cycle phase, Key considerations when transforming IAM, People, Process Technology, IAM tools, Key IAM capabilities, Conclusion, Detention, Field Acquisition & Analysis, Solid State Drives, Brief Discussion of Cylinders, Heads, and Sectors , Logical Block Addressing and Physical Block Addressing, "TRIM" Command
8.17	Unit E	**Encryption and Decryption**
8.18	Unit E Topic 1	Encryption and decryption, What is cryptography?, Strong cryptography, How does cryptography work?, Conventional cryptography, Caesar's Cipher, Key management and conventional encryption, Public key cryptography, How PGP works, Keys, Digital signatures, Hash functions, Digital certificates, Certificate distribution, Certificate servers, Public Key Infrastructures, Certificate formats, Validity and trust
8.18	Unit E Topic 2	, Checking validity, Establishing trust, Meta and trusted introducers, Trust models, Levels of trust in PGP , Certificate Revocation, Communicating that a certificate has been revoked , What is a passphrase?, Key Splitting, Encryption, Data Encryption - Overview , Symmetric Encryption and Asymmetric encryption, Conclusions. Digital signature, Secure Sockets Layer (SSL), Encryption Protects Data During Transmission
8.20	Unit E Topic 3	, Credentials Establish Identity Online, Authentication Generates Trust in Credentials, Extend Protection beyond HTTPS, Understanding SSL, Who Uses SSL?, How It Works, SSL Transactions , SSL Crypto Algorithms, SSL and the OSI Model, Secure messaging, Message digest, Security Technology, Identity, Integrity, Active Audit, Cryptography, Public key infrastructure, Non-repudiation, Public Key Encryption, Introduction to Authentication, Background, SSL authentication (server --> client), Mutual SSL Authentication (server <--> client), Capture and Analyze

10	**Reading Content**	
9.1	Text book*	**Security in Cloud** (IBM ICE Publication)

9.2	other references	www.bluecoat.com/documents 2. www.trustwave.com 3. An introduction to cryptography – By Network Associates 4. Identity and access management 5. http://www.ey.com

B.Tech-CSE Cloud Technology & Information Security

School:		Batch : 2019		
Program:		**Current Academic Year:**		
Branch:		**Semester: 5**		
1	Course Code	CSE 211	Course Name	
2	Course Title	**Object Oriented Programming using Java**		
3	Credits	4		
4	Contact Hours (L-T-P)	3-1-0		
	Course Status	Semester-05		
5	Course Objective	**Students will try to learn:** 1. To introduce the concept of OOPS programming. 2. To provide the knowledge of method and classes. 3. To become familiar with exception handling, Multithreading 4. To understand the server request and response. 5. To provide knowledge about advance frameworks of java.		
6	Course Outcomes	On successful completion of this module students will be able to: ***1. Develop web related concepts in java.*** ***2. Develop the concept of Java server pages.*** ***3. Implement the concept of database and describe the servers.*** ***4. Describe the concept of hibernate.*** ***5. Implement the concept of struts and spring.***		
7	Course Description	This course introduces the core and advance java programming. In this course we also implement the enterprise related concepts in J2EE.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction to Java**		
	A	The meaning of Object Orientation, Features of Java, OOPs concepts object identity, Encapsulation, information hiding, polymorphism inheritance Java virtual machine, Byte Code, Architecture of JVM, Class Loader Execution Engine, Garbage collection.		CO1,CO3,
	B	Java development Kit(JDK),Introduction to IDE for java development, Setting java environment, Constants, Variables, Data Types, Operators, Expressions. Decision Making Branching, Loops, command line argument.		CO1
	C	Arrays, Type conversion & casting, Input from		CO1, CO3

		keyboard, Classes Objects. Methods Method overloading, Constructors, Constructors overloading. static keyword, Introducing Access Control, String handling.			
	Unit 2	**Concepts of OOPS**			
	A	Multilevel Hierarchy, Overriding methods, Polymorphism, use of this and super, Constructor call in inheritance Abstract class and method, Final class, method and variable, Implementing Interface, Concept of multiple inheritance in Java, Wrapper class			CO1, CO2
	B	Packages: User defined packages, built-in packages (java.lang package), Access modifiers.			CO1, CO2
	C	**Exception and Multithreading:** Input/output: Exploring java.io, File,StreamClassesByte Stream Classes and Character stream Classes Introduction to Multithreading: Creating thread using Runnable interface and Thread class, Thread life cycle, Thread priorities, sleep method.			CO1, CO2,CO3
	Unit 3	**Servlets & JSP**			
	A	Introduction to servlet ,Servlet APIs,Generic and HTTP servlet, ServletRequest, ServletConfig, ServletContext, Session in servlet , Servlet Events, Servlet CURD,Apcahe Server and Eclipse IDE			CO3
	B	JSP :JSP life cycle,Tags in JSP ,Implicit Objects , JSP Exceptions , Directive, JSP action MVC ,JSTL, CRUD in JSP			CO3
	C	Database in action, IDEs and server :Introduction to My SQL, Workbench , Insert,Read,Update and Delete operations , Configuration of server with different port . Configuration of eclipse with Jar files .Types of projects in Eclipse .			CO3
	Unit 4	**Hibernate**			
	A	Hibernate Introduction , HB architecture , Mapping in Hibernate			CO1,CO2,CO3,CO4
	B	Configuration and mapping file , Web application,			CO1,CO2,CO3,CO4
	C	HB with Log4j ,Inheritance Mapping , Collection Mapping , Association Mapping.			CO1,CO2,CO3,CO4
	Unit 5	**Struts and Spring**			
	A	**Introduction to Struts ,Models ,Interceptors, Value Stack , Action Context ,**			CO1,CO2,CO3,CO5
	B	**Validation in struts ,Spring ,Dependency Injection ,**			CO1,CO2,CO3,CO5
	C	**Spring AOP, Spring JdbcTemplate, SPEL, Spring MVC, Spring Web, Spring remoting. .**			CO1,CO2,CO3,CO5
	Mode of examination	Theory			
	Weightage	CA	MTE	ETE	

	Distribution	30%	20%	50%	
	Text book/s*	1. Schildt H, "The Complete Reference JAVA2", TMH 2. Professional Java Programming:BrettSpell,WROX Publication.			
	Other References	1. Balagurusamy E, "Programming in JAVA", TMH.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	CO-1. ***Develop web related concepts in java.***	PO1,PO2, PO3,PO5, PSO1,PSO2
2.	***CO -2 Develop the concept of Java server pages.***	PO1,PO2, PO3,PO5
3.	***CO-3 Implement the concept of database and describe the servers***	PO1,PO2, PO3, PO4, PO5,PSO1,PSO2
4.	***CO-4 Describe the concept of hibernate.***	PO1,PO2, PO3, PO5,PO11,PO12,PSO1,PSO2
5	***CO-5 Implement the concept of struts and spring***	PO11,PO12,PSO3,PSO5

PO and PSO mapping with level of strength for Course Name J2SE and J2EE

Course Objectives	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3		3	2				1	1	1	3	3	1	1	1
CO2	3	3	3	2	3	1				1	1	1	1	1	1	1	1
CO3	3	3	3	3	3	1				1	1	1	1	3	2	1	1
CO4	1	2	2	2	1	1				1	3	3	3	3	1	1	1
CO5	1	1	1	1	1	1				1	3	3	1	1	1	1	1

1. Addressed to***Slight (Low=1)extent2.*** Addressed to***Moderate (Medium=2) extent***
3. Addressed to***Substantial (High=3) extent***

School:		**Batch : 2019**		
Program:		**Current Academic Year:**		
Branch:		**Semester:5**		
1	Course Code	CSE 344	Course Name	
2	Course Title	**Introduction to information security**		
3	Credits	3		
4	Contact Hours (L-T-P)	3-0-0		
	Course Status			
5	Course Objective	***1 To understand the mathematical foundations of security principles*** ***2. To appreciate the different aspects of encryption techniques*** ***3 To understand the role played by authentication in security*** ***4 To appreciate the current trends of security practices*** ***5. To provide a foundation for basic concept of security and cryptography technique.***		
6	Course Outcomes	On successful completion of this module students will be able to: ***1. Demonstrate the basic cryptographic tools and techniques.*** ***2. Understand the basic requirement and concept of cryptography.*** ***3. Analyze the different method of cryptography.*** 4. ***Describe the advance cryptography method*** ***5. Discuss available security practices***		
7	Course Description	This course introduces information security concept and encryptions techniques.		
8	Outline syllabus			CO Mapping
	Unit 1	**Introduction to Information Security**		
	A	Overview of Information security, Threats, Type of Vulnerabilities and Risk, Business Requirements,.		CO1
	B	Information Security Definitions – Security Policies – Tier 1 (origination Level), Tier 2 (Functional Level), Tier 3 (Application or Device Level), Procedures, Standards, Guidance		CO1, CO2
	C	Role of Governance in Information Security, Develop a Risk Management Program, Risk Management Process, Best Practices for IT Governance.		CO1, CO2
	Unit 2	**Information Asset Classification**		

	A	Classification of Information, Information Assets – Owner, Custodian, User	CO1, CO2
	B	Information Classification in terms of Secret, Confidential, Private and Public, Declassification.	CO1, CO2
	C	Retention and Disposal of Information Assets. Provide Authorization for Access – Owner, Custodian and User	CO1, CO2
	Unit 3	**Access Control**	
	A	User Identity and Access Management- Account Authorization, Access and Privilege Management, System and Network Access Control. Operating Systems	CO1,CO2,CO3
	B	Access Controls, Monitoring Systems Access Controls, Intrusion Detection System, Event logging,	CO1,CO2,CO3
	C	Cryptography. Physical Security: Identify Assets to be Protected, Perimeter Security, Firewalls, Prevention and Detection Systems, Safe Disposal of Physical Assets. Email Security: PGP, MIME, IP Security: IP security overview.	CO1,CO2,CO3
	Unit 4	**Introduction to Cryptography**	
	A	Introduction to Advanced Cryptography and Cryptanalysis, Classical Encryption	CO2,CO3,CO4
	B	Techniques – Substitution Techniques, Transposition Techniques, Permutation Method.	CO3,CO4
	C	Advanced Encryption Techniques and Security Issues – RC4, One-time Pad, RSA, DES, Triple DES, AES and Diffie Hellman.	CO2, CO4
	Unit 5	**Conventional Encryption**	
	A	Confidentiality using conventional encryption – Placement of Encryption, Traffic Confidentiality	CO2,CO5,
	B	Key Distribution and Random Number Generation. Key management – Generating Keys, Nonlinear Key	CO3,CO5

		spaces,			
	C	Transferring Keys, Verifying Keys, Using Keys, Updating Keys, Storing keys, Backup keys, Compromised Keys, Lifetime of Keys, Destroying Keys and Public-Key Management			CO4,CO5,
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Ec-Council, "Ethical Hacking and Countermeasures: Attack Phases", Delmar Cengage Learning, 2009. 1. 2. Information Security Risk Analysis - Thomas R. Peltier, Third Edition, Pub: Auerbach, 2012			
	Other References	1. 1. Applied Cryptanalysis – Breaking Ciphers in the Real World Stamp, Richard M.Lo 2. . Wade Trappe and Lawrence C. Washington, "Introduction to Cryptography with Coding Theory" Second Edition, Pearson Education, 2007.			

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	. ***CO-2. Demonstrate the basic cryptographic tools and techniques.***	PO2, PO5, PO12,PSO1,PO6
2.	***CO-3. To appreciate the different aspects of encryption techniques.***	PO1, PO2,PO4, PO6, PO12,PSO2,PO7
3.	***CO-3. To understand the role played by authentication in***	PO2, PO3, PO4, PO5,

	security	PO12,PSO3,PO6
4.	***CO-4 To appreciate the current trends of security practices***	PO2, PO3, PO12,PSO2,PO8,PO7
5 .	***CO-5 Discuss available security practices***	PO2, PO3, PO4, PO5,PSO4,PO6

PO and PSO mapping with level of strength for Course Name Introduction to information security (Course Code yyyy)

Course Objectives	PO1	PO2	PO 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1	PO 11	P O 12	PS O 1	P S O 2	P S O 3	P S O 4	P S O 5
CO1		3	2		2		1		1			3	3		3		2
CO2	3	3		3		3					2	3		3	3		
CO3		2	3	3	3			2				3	3	1			
CO4	1	3	3				1		1			3		3			
CO5		3	3	3	3	1		1			2					3	

1. Addressed to***Slight (Low=1)extent2.*** Addressed to***Moderate (Medium=2) extent***
3. Addressed to***Substantial (High=3) extent***

1	Course Code	**CSE 456**
2	Course Title	**Automata and Compiler Design**
3	Credits	**4**
4	Contact Hours	**3-1-0**
5	Course Objective	The objective of this course is to provide fundamental knowledge of Finite automata Learning about automata, grammar, language, and their relationships. Also,Introduces the major phases of Compiler construction and also its theoretical aspects including regular expressions, context-free grammars, Finite Automata
6	Course Outcomes	After completing this course, students will be able to: 1. Analyses and design finite automata, formal languages, and grammars. 2. Demonstrate their understanding of key notions, such as algorithm, computability, decidability, and complexity through problem solving. 3. Employ formal attributed grammars for specifying the syntax and semantics of programming languages 4. Implement parsing and translation techniques for automation of computing tasks
7	**Prerequisite**	
8	**Course Contents**	
8.01	Unit A	**Introduction to Finite Automata**
8.02	Unit A Topic 1	Finite Automata (FA), Transition graph, Nondeterministic finite Automata (NFA), Deterministic finite Automata (DFA).
8.03	Unit A Topic 2	Equivalence of NDFA and DFA, Construction of DFA from NFA and optimization of Finite Automata
8.04	Unit A Topic 3	Applications and Limitation of FA.
8.05	Unit B	**Regular Expressions and Regular languages**
8.06	Unit B Topic 1	Regular Expression, Regular Expression to Finite Automata.
8.07	Unit B Topic 2	Properties of Regular Languages, Applications of regular expressions, properties of regular languages- proving languages not to be regular
8.08	Unit B Topic 3	Pumping lemma for regular languages **,** Closure properties of regular languages

8.09	Unit C	**Context Free Grammars and Languages**
8.10	Unit C Topic 1	Definition of Context-free grammars, derivations using a grammar, Leftmost and rightmost derivations, the language of a grammar and sentential forms, exercise problems, Parse trees – constructing a parse tree, the yield of a parse tree, inference, derivations and parse trees.
M8.11	Unit C Topic 2	Ambiguity in grammars and languages – ambiguous grammars, Chomsky normal form (CNF)
8.12	Unit C Topic 3	Closure properties of context free languages., Pumping lemma for CFLs
8.13	Unit D	**Phases and Passes in Compiler Design**
8.14	Unit D Topic 1	Introduction to Compiler, Phases and passes, Bootstrapping, Cross-Compiler
8.15	Unit D Topic 2	Finite state machines and Regular expressions and their applications to lexical analysis
8.16	Unit D Topic 3	Lexical-Analyser generator, LEX-compiler Lexical Phase errors
8.17	Unit E	**Parsing Techniques**
8.18	Unit E Topic 1	The syntactic specification of programming languages: Context free grammars, derivation and parse trees
8.19	Unit E Topic 2	Basic Parsing Techniques: Parsers, Shift reduce parsing, operator precedence parsing, top down parsing, predictive parsers. Automatic Construction of efficient Parsers: LR parsers, the canonical Collection of LR(0) items, constructing SLR parsing tables
8.20	Unit E Topic 3	Constructing Canonical LR parsing tables, Constructing LALR parsing tables, using ambiguous grammars
10	**Reading Content**	
9.1	Text book*	• Introduction to Automata theory, Languages and Computation, John E. Hopcroft, Rajeev Motwani, Jeffery D. Ullman, Third Edition Pearson education. 2007 • Aho, Sethi, Ulman, compilers Principles, Techniques, and Tools, Pearson Education, 2003

9.2	other references	• Fundamentals of the Theory of computation, Principles and Practice, Raymond Greenlaw, H. James Hoover, Morgan Kaufmann,1998 • Peter Linz, “Formal Languages and Auomata”, Narosa Publishing House • Lauden, Principles of Compiler Construction.

School:		**Batch : 2019**	
Program:		**Current Academic Year:**	
Branch:		**CSE**	
1	Course Code	CSE465	Course Name
2	Course Title	**Amazon Web Services**	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
	Course Status		
5	Course Objective	**Students will try to learn:** 1. To Classify and differentiate the types of Cloud Computing with its different modes 2. To provide the knowledge of method and classes. 3. Discuss about Amazon cloud and its component 4 Measure the different component of cloud. 4. To provide knowledge about advance frameworks of many domains on web.	
6	Course Outcomes	On successful completion of this module students will be able to: 1. Explain about the instance of cloud 2.Describe about EC2,EBS and load balancing 3. Explain Apache and My sql server with cloud example 4. State networking component of VPC and cloud Security 5. Explain about Amazon VPC	
7	Course Description	This course introduces the core and advance java programming. In this course we also implement the enterprise related concepts in J2EE.	
8	Outline syllabus		CO Mapping
	Unit A	**Introduction to Cloud Computing and Amazon Web Services**	
	Unit A Topic 1	Introduction to Cloud Computing, Cloud Service Delivery Models (IAAS, PAAS, SAAS), Cloud Deployment Models (Private, Public, Hybrid And Community), Cloud Computing Security, Case Study.	CO1,CO2
	Unit A Topic 2	Introduction to Amazon Web Services, Why Amazon? Use Cases, AWS Storage Options, AWS Compute Options, AWS Database Options, AWS Workflow Automation And Orchestration Options, AWS Systems Management And Monitoring Options	CO1,CO2
	Unit A Topic 3	AWS Virtual Private Cloud Introduction, Pricing Concepts	CO1,CO5
	Unit B	**Introduction to EC2**	Unit B

	Unit B Topic 1	Introduction To EC2, Instance Types And Uses, Autoscaling Instances, Amazon Machine Images (AMIS), Modifying Existing Images, Creating New Images Off Of Running Instances.	CO1,CO2
	Unit B Topic 2	Converting An Instance Store AMI To An EBS AMI, Instances Backed By Storage Types	CO2,CO3
	Unit B Topic 3	Creating A Web Server Using Ec2, Elastics Block Storage (EBS), Elastic IPS, Route 53 DNS System, Cloudfront SNS Pricing	CO1,CO2
	Unit C	**S3, CLOUDWATCH, ELASTIC BEANSTALK AND SECURITY**	
	Unit C Topic 1	Introduction To S3, Buckets And Objects, Security, Creating A Web Server Using S3 Endpoints, Introduction To Cloudwatch, Creating Alarm Notifications, Autoscaling Instances, Deploying Scalable Application On AWS, Selecting And Launching An Application Environment, Provisioning Application Resources with Cloud formation	CO2,CO3
	Unit C Topic 2	Describe Amazon Dynamo, Understand key aspects of Amazon RDS, Launch an Amazon RDS instance, Identify what is Cloud Formation, Describe Amazon Cloud Watch metrics and alarms, Describe Amazon Identity and Access Management (IAM)	CO2,CO3
	Unit C Topic 3	Security In AWS, IAM (Identity And Access Management), Access Control Lists (ACLs), Securing Data at Rest And In Motion, Security Groups.	CO2,CO3,CO4
	Unit D	**AWS Storage, Elasticity and AWS Networking**	Unit B
	Unit D Topic 1	Amazon Storage, S3 Storage Basics, Managing Voluminous Information with EBS, Glacier Storage Service	CO2,CO4
	Unit D Topic 2	AWS Networking: Networking Basics, VLAN Basics, Basics of AWS VLANs	CO2,CO4
	Unit D Topic 3	AWS Network IP Addressing and Mapping	CO2,CO4
	Unit E	**VIRTUAL PRIVATE CLOUD (VPC)**	
	Unit E Topic 1	Load Balancers And Availability Zones, Elastic Network Interfaces (ENI), Setting Up VPC And Internet Gateway	CO4,CO5
	Unit E Topic 2	Setting Up a Security Group, Launching And EC2 Instance And Assigning An ENI, Setting Up A VPN, Setting Up A Customer Gateway For VPN	CO4,CO5

<table>
<tr><td></td><td>Unit E Topic 3</td><td colspan="3">Setting Up Dedicated Hardware For VPC, Scenario 1:VPC With A Public Subnet Only (Standalone Web), Scenario 2: VPC with Public And Private Subnets (3 Tier App), Scenario 3:VPC With Public And Private Subnets And Hardware VPN Access (Web On The Cloud, Database and App On Prem) Scenario 4: VPC With A Private Subnet Only And Hardware VPN Access. (Extension Of Your Corporate Network), Case Study</td><td>CO4,CO5</td></tr>
<tr><td></td><td>Mode of examination</td><td colspan="3">Theory</td><td></td></tr>
<tr><td rowspan="2"></td><td rowspan="2">Weightage Distribution</td><td>CA</td><td>MTE</td><td>ETE</td><td></td></tr>
<tr><td>30%</td><td>20%</td><td>50%</td><td></td></tr>
<tr><td></td><td>Text book/s*</td><td colspan="4">3. TMH, Introduction to AWS</td></tr>
<tr><td></td><td>Other References</td><td colspan="4"></td></tr>
</table>

<u>CO and PO Mapping</u>

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	***CO-1.*** Explain about the instance of cloud	PO1,PO2, PO3,PO5, PSO1,PSO2
2.	***CO-2.*** Describe about EC2,EBS and load balancing	PO1,PO2, PO3,PO5
3.	***CO-3*** Explain Apache and My sql server with cloud example	PO1,PO2, PO3, PO4, PO5,PSO2
4.	CO-4 State networking component of VPC	PO1,PO2, PO3,PSO1
5.	***CO-5*** Explain about Amazon VPC	PO1,PO2, PO3, PO5,PSO1,PSO2

PO and PSO mapping with level of strength for Course Name Amazon Web Services (Course Code yyyy)

Course Objectives	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	3	3	3		3	2	3	3					3	3	1		
CO2	3	3						1	1					1	1		
CO3	3	3						3	2					3	2		
CO4	3	3	2	2			3	2	2				2	1	2	1	

CO5	3	1	3		1		1	1					3	3	1		

1. Addressed to***Slight (Low=1)******extent******2.*** Addressed to***Moderate (Medium=2)*** ***extent***
3. Addressed to***Substantial (High=3)*** ***extent***

School:		**Batch : 2019**	
Program:		**Current Academic Year:**	
Branch:		**CSE**	
1	Course Code	CSE 346	Course Name: B.Tech(CSE)
2	Course Title	**Introduction to Cloud Technology**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status		
5	Course Objective	**Students will try to learn:** 1. To provide students with the fundamentals and essentials of Cloud Computing. 2. To provide students a sound foundation of the Cloud Computing so that they are able to start using and adopting Cloud Computing services and tools in their real life scenarios 3. To provide a knowledge of some important cloud computing driven commercial systems such as GoogleApps, Microsoft Azure and Amazon Web Services and other businesses cloud applications.	
6	Course Outcomes	On successful completion of this module students will be able to: ***1. Articulate the main concepts, key technologies, strengths, and limitations of cloud technology.*** ***2. Choose the appropriate technologies, algorithms, and cloud provider for related issues.*** ***3. Explain the core issues of cloud computing such as security, privacy, and interoperability.*** ***4. Attempt to generate new ideas and innovations in cloud computing.*** ***5. Understand the governance related issues like data privacy and others in maintain a cloud systems.***	
7	Course Description	This course provides a graduate-level comprehensive introduction to cloud technology with an emphasis on advanced topics.	
8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Introduction to Cloud Computing, History and Evolution of Cloud Computing, Types of clouds, Private Public and hybrid clouds.	CO1, CO3
	B	Cloud Computing architecture, Cloud computing infrastructure, Merits of Cloud computing, , Cloud computing delivery models and services (IaaS, PaaS, SaaS), obstacles for cloud technology.	CO3, CO5

	C	Cloud vulnerabilities, Cloud challenges, Practical applications of cloud computing.			CO3
	Unit 2	**Cloud Computing Companies and Migrating to Cloud**			
	A	Web-based business services, Delivering Business Processes from the Cloud: Business process examples, Broad Approaches to Migrating into the Cloud.			CO2, CO3
	B	The Seven-Step Model of Migration into a Cloud, Efficient Steps for migrating to cloud.			CO1, CO3
	C	Risks: Measuring and assessment of risks, Company concerns Risk Mitigation methodology for Cloud computing, Case Studies.			CO3, CO4
	Unit 3	**Cloud Cost Management and Selection of Cloud Provider**			
	A	Assessing the Cloud: software Evaluation, System Testing, Seasonal or peak loading, Cost cutting and cost-benefit analysis, Selecting the right scalable application, Considerations for selecting cloud solution			CO1,CO2,CO4
	B	Understanding Best Practices used in selection of Cloud service and providers, Clouding the Standards and Best Practices Issue: Interoperability, Portability, Integration, Security.			CO1,CO2
	C	Standards Organizations and Groups associated with Cloud Computing, Commercial and Business Consideration			CO2,CO4
	Unit 4	**Governance in the Cloud**			
	A	Industry Standards Organizations and Groups associated with Cloud Computing, Need for IT governance in cloud computing.			CO5,CO3
	B	Cloud Governance Solution: Access Controls, Financial Controls, Key Management and Encryption, Logging and Auditing, API integration, Legal Issues: Data Privacy and Security Issues.			CO5,CO1,CO3
	C	Cloud Contracting models, Jurisdictional Issues Raised by Virtualization and Data Location, Legal issues in Commercial and Business Considerations.			CO5,CO3
	Unit 5	**5 ten cloud do an do nots**			
	A	Don’t be reactive, do consider the cloud a financial issue, don’t go alone, do think about your architecture, don’t neglect governance, don’t forget about business purpose,			CO5, CO3
	B	Do make security the centerpiece of your strategy, don’t apply the cloud to everything, Don’t forget about Service Management, do start with a pilot project.			CO4
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Bernard Golden “*AWS for dummies*”,Edition:1 , Wiley			

		Publisher 2. Thomas Erl, Ricardo puttini, Cloud Computing: Concepts, Technology & Architecture, Prentice Hall Publication

CO and PO Mapping

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	***CO-1.*** ***Articulate the main concepts, key technologies, strengths, and limitations of cloud technology.***	PO2, PO5, PO12, PSO3
2.	***CO-2.*** ***Choose the appropriate technologies, algorithms, and cloud provider for related issues.***	PO2, PO5, PO7, PO12, PSO2
3.	***CO-3.*** ***Explain the core issues of cloud computing such as security, privacy, and interoperability.***	PO2, PO5, PO11, PO12
4.	***CO-4.*** ***Attempt to generate new ideas and innovations in cloud computing.***	PO5, PO7, PO11, PO12, PSO5
5.	***CO-5.*** ***Understand the governance related issues like data privacy and others in maintain a cloud systems.***	PO2, PO5, PO9, PO10

PO and PSO mapping with level of strength for Course NameIntroduction to Cloud Technology (Course Code yyyy)

Course Objectives	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1		3			3							3			3		
CO2	1	3			3		3					3		3			
CO3	1	3			3						3	3					
CO4			1	1	3		3				3	3					3
CO5		2			3	1			3	3				1		1	

1. Addressed to***Slight (Low=1)extent2.*** Addressed to***Moderate (Medium=2) extent***
3. Addressed to***Substantial (High=3) extent***

School : SET		Batch : 2019	
Program:		**Current Academic Year:**	
Branch:		**Semester: 07**	
1	Course Code	CSE459	Course Name: B.Tech(CSE)
2	Course Title	**Disaster Recovery and Business Continuity Management (DRBCM1)**	
3	Credits	4	
4	Contact Hours (L-T-P)	3-1-0	
	Course Status		
5	Course Objective	**Students will try to learn:** 1. The importance of disaster recovery (DR) and business continuity management (BCM) in achieving the availability objective of Information Security. 2. Important steps and documentation involved in developing a business continuity plan (BCP) and how BCP, DRP and BCM are inter-related. 3. Various recovery strategies that are useful in BCP.	
6	Course Outcomes	On successful completion of this module students will be able to: ***1. Explain DR and BCP are useful in ensuring availability of information.*** ***2. Elaborate on the various steps stages and strategies in developing BCP.*** ***3. Identify data storage technologies appropriate for secure data backups.*** ***4. Investigate existing industry software and tools which support competent continuity strategies.*** ***5. Conduct a case study on IT organization and create a BCP.***	
7	Course Description	This course provides a graduate-level comprehensive introduction to subject named Disaster Recovery and Business Continuity Management (DRBCM1).	
8	Outline syllabus		CO Mapping
	Unit 1	**Business Continuity Management (BCP)**	
	A	Introduction to Business Continuity Planning (BCP), Business Resumption Plan (BRP) or Disaster Recovery Plan (DRP)	CO1, CO2
	B	Common terminologies used in BCP and DRP, Business Continuity Management (BCM), NIST SP800-34 Emergency Action plan which includes the phases of Recover/Resume, Protect and Sustain, Causes of Disasters.	CO1
	Unit 2	**Stages in BCP**	
	A	BCP objectives. Information Protection Environment. Security Technology and Tools.	CO1, CO2

	B	Steps involved in creating a BCP, Phase 1: Project Management and Initiation. Phase 2: Business Impact Analysis. Phase 3: Recovery Strategies, Phase 4: Plan Development and Implementation..			CO1, CO2
	Unit 3	**Business Recovery strategies**			
	A	Facility and Supply Recovery strategies. User Recovery strategies. Technical Recovery strategies, Data Recovery strategies, Activation Phase- Major Disaster or Disruption, Intermediate Disaster or Disruption			CO1, CO3
	B	Minor Disaster, Activating BC/DR Teams, Developing Triggers, Transition Trigger. Defining BC/DR Team and Key Personnel, Defining Tasks, Assigning Resources, Communication Plan.			CO2,CO3
	Unit 4	**Testing, Maintenance, Awareness & Training Mechanisms**			
	A	Different types of tests including structured walk-through.			CO2, CO3,CO4
	B	Checklist test, simulation, parallel test and full interruption test. Steps required to maintain a BCP			CO2, CO3, CO4
	Unit 5	**Preparation of BCP**			
	A	Requirements for BCP awareness and training			CO4,CO5
	B	Conduct a case study of IT Organization and prepare a Business Continuity Plan for the same using the learning from this course			CO4,CO5
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	1. Business Continuity and Disaster Recovery Planning for IT Professionals by Susan Snedaker, Syngress; 2 edition (31 October 2013) 2. Business Continuity and Disaster Recovery Planning by Stuart Hotchkiss, BCS, The Chartered Institute for IT, 1st ed; 2011 3. Information Systems Security: Security Management, Metrics, Frameworks and Best Practices by Nina Godbole, Wiley, 1st ed; 2008 4. Planning for Disaster: A Business Survival Guide by Harry Flowers, CreateSpace Independent Publishing Platform; 1 edition (15 August 2015)			

<u>CO and PO Mapping</u>

S. No.	Course Outcome	Program Outcomes (PO) & Program Specific Outcomes (PSO)
1.	***CO-1. Explain DR and BCP are useful in ensuring availability of information.***	PO2, PO12, PSO3
2.	***CO-2. Elaborate on the various steps stages and strategies in developing BCP.***	PO2, PO5, PO8, PO12, PSO2
3.	***CO-3. Identify data storage technologies appropriate for secure data backups.***	PO2, PO5, PO11, PO12
4.	***CO-4. Investigate existing industry software and tools which support competent continuity strategies.***	PO5, PO11, PO12, PSO2, PSO5
5.	***CO-5. Conduct a case study on IT organization and create a BCP***	PO2, PO5, PO9, PO10, PO12

PO and PSO mapping with level of strength for Course NameCOBIT, VALIT and IT Risk (Course Code yyyy)

Course Objectives	PO1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1 0	PO 11	P O 12	PS O 1	P S O 2	P S O 3	P S O 4	P S O 5
CO1		3					1					3			3		
CO2		2	1		3			2				3		3			1
CO3		3			3		1				3	3				1	
CO4		1			3			1			3	3		3			3
CO5	1	3			3				3	3		3					1

1. Addressed to***Slight (Low=1)extent2.*** Addressed to***Moderate (Medium=2) extent***
3. Addressed to***Substantial (High=3) extent***

1	Course Code	CSP346
2	Course Title	**Introduction to Cloud Technology**
3	Credits	4
4	Contact Hours	(3-0-2)
5	Course Objective	To provide students about the cloud introduction
6	Course Outcomes (CO)	On successful completion of this module students will be able to: 1. Use of Cloud Technlogy 2. Description of Cloud provider . 3. Able to show about the cloud development 4. Use of operation on cloud. 5.Can explain the pros and cons of Cloud
7	**Prerequisite**	Students should have experience with basic internet and programming

8.21	Lab Experiment 01	Study the basic cloud architecture and represent it using a case study
8.22	Lab Experiment 02	Enlist Major difference between SAAS PAAS &Iaas also submit a research done on various companies in cloud business and the corresponding services provided by them , tag them under SAAS , Paas&Iaas.
8.23	Lab Experiment 03	Study and present a report on Jolly cloud.
8.24	Lab Experiment 04	Present a report on obstacles and vulnerabilities in cloud computing on generic level
8.25	Lab Experiment 05	Present a report on Amazon cloud services.
8.26	Lab Experiment 06	Present a report on Microsoft cloud services
8.27	Lab Experiment 07	Enlist and explain legal issues involved in the cloud with the lelp of a case study
8.28	Lab Experiment 08	Explain the process of migrating to cloud with a case study.
8.29	Lab Experiment 09	You are tasked with finding all SUID & SGID files under the / directories.
8.30	Lab Experiment 10	Present a report on google cloud and cloud services.