Program Structure
School of Engineering and Technology
Department of Mechanical Engineering
Program: B.Tech Mechanical Engineering
Program code: SET0601
(Batch: 2019-2023)

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

Transformative educational experience
Enrichment by educational initiatives that encourage global outlook
Develop research, support disruptive innovations and accelerate entrepreneurship
Seeking beyond boundaries

Core Values

Integrity
Leadership
Diversity
Community

Vision of the School of Engineering and Technology

To become a globally acclaimed institution of higher learning in engineering and technology promoting excellence in research, innovation and entrepreneurship to provide sustainable solution to the needs of the society

Mission of the School Engineering and Technology

1. To impart quality education with strong industry & academic connectivity in the expanding fields of Engineering and Technology in a conducive and enriching learning environment.
2. To produce 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 counseling.

1.2.1 Vision and Mission of the Department of Mechanical Engineering

Vision of the Department of Mechanical Engineering

To be a centre of learning for preparing professional mechanical engineers, having passion for innovation, entrepreneurship and research, to provide a sustainable solution to the needs of the society

Mission of the Department of Mechanical Engineering

M1. To offer a curriculum that prepares students with knowledge, skills and ethical values for exploring professional practices.

M2. To train students in to global leaders through industry driven and research oriented teaching-learning pedagogy.

M3. To groom students into globally competent professionals and entrepreneurs, who are sensitive to the issues of environment, energy, and emergent needs of the society.

M4. To equip students with necessary skills to contribute innovatively in creating knowledge through higher learning.

1.3 Program Educational Objectives (PEO)

1.3.1 Program Educational Objectives (PEO) B.Tech Mechanical Engineering

The Educational Objectives of B.Tech Mechanical Engineering are:

PEO1: Graduates will excel in applying knowledge of Mechanical Engineering fundamental to pursue a successful career in interdisciplinary research, innovation and entrepreneurship to provide sustainable solutions to the societal needs.

PEO2: Graduates will understand and explore innovative technologies of mechanical engineering, automobile engineering, mechatronics, industrial engineering and related areas to solve real industrial problems.

PEO3: Graduates will build up the adequate communication skills, proficient personality, moral esteems and ethical values to be a good human beings, responsible citizens, capable experts and team leaders.

PEO4: Graduates will pursue higher Education and involve themselves in developing their knowledge, research skills to meet the global standards.

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 : Ability to adapt the advance technologies in the area of design, manufacturing, thermal sciences automation and industrial engineering to add value to the technological world.

PSO2 : Ability to design the futuristic automobile systems using core knowledge in vehicle body, vehicle dynamics, vehicle performance, vehicle systems subjected to moral, social and environmental constraints.

PSO3: Ability to design and develop mechatronics systems by synergistic blend of precision mechanical engineering and electronic control systems

School of Engineering and Technology

B.Tech-Mechanical Engineering

Batch: 2019-2023

TERM: I

S. No.	Subject Code	Subjects	Teaching Load			Credits
			L	T	P	
Theory Subjects						
1.	CSE113	Programming for Problem Solving	3	0	0	3
2.	HMM111	Human Values and Ethics	2	0	0	2
3.	MTH141	Calculus, Analysis and Linear Algebra	3	1	0	4
4.	PHY120	Engineering Physics	2	1	0	3
5.	EEE112	Principles of Electrical and Electronics Engineering	2	1	0	3
Practical/Viva-Voce/Jury						
6.	MEP107	Introduction to Mechanical Engineering	0	0	2	1
7.	CSP113	Programming for Problem Solving Lab	0	0	2	1
8.	PHY151	Engineering Physics Lab	0	0	2	1
9.	MEP106	Computer Aided Design & Drafting Lab	0	0	3	1.5
10.	EEP112	Principles of Electrical and Electronics Engineering Lab	0	0	2	1
11.	FEN101 / FEN103	Functional English-Beginners 1 Lab/ Intermediate	0	0	4	2
TOTAL CREDITS						**22.5**

School of Engineering and Technology

B.Tech-Mechanical Engineering

Batch: 2019-2023

TERM: II

No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
Theory Subjects						
1.	CSE114	Application based Programming in Python	3	0	0	3
2.	MTH144	Differential Equations, Special Transforms And Statistic	3	1	0	4
3.	PHY119	Advanced Physics	2	1	0	3
4.	CHY111	Engineering Chemistry	3	0	0	3
5.	EVS103	Environmental Science	3	0	0	3
Practical/Viva-Voce/Jury						
6.	CEP114	Application based Programming in Python Lab	0	0	2	1
7.	PHY152	Advanced Physics Lab	0	0	2	1
8.	CHP111	Engineering Chemistry Lab	0	0	2	1
9.	MEP105	Mechanical Workshop	0	0	3	1.5
10.	FEP102/ FEP104	Functional English Beginners 2 Lab / Intermediate	0	0	4	2
11.	MEP201	Idea Generation and Creativity Lab	0	0	2	1
TOTAL CREDITS						**23.5**
Summer Internship I conducted after II term to be evaluated in III term						

School of Engineering and Technology

B.Tech-Mechanical Engineering

Batch: 2019-2023

TERM: III

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
Theory Subjects						
1.	BTY223	Introduction to Biology for Engineers	2	0	0	2
2.	MEC227	Basic Thermodynamics	3	0	0	3
3.	MEC225	Material Science	2	0	0	2
4.	MEC228	Engineering Mechanics	3	0	0	3
5.	ARP203	Aptitude Reasoning and Business Communication Skills- Basic	1	0	0	1
Practical/Viva-Voce/Jury						
6.	ARP203	Aptitude Reasoning and Business Communication Skills- Basic	0	0	2	1
7.	MEP 226	Numerical Analysis with MATLAB	0	0	4	2
8.	MEP251	Project Based Learning I	0	0	2	1
9.	MEP295	Industrial Internship I	-	-	-	1
10.	MEP225	Metrology	0	0	2	1
TOTAL CREDITS						**17**

School of Engineering and Technology

B.Tech – Mechanical Engineering

Batch: 2019-2023

TERM: IV

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
Theory Subjects						
1.	MEC229	Fluid Mechanics	3	0	0	3
2.	HMM305	Management for Engineers	3	0	0	3
3.	MEC230	Strength of Materials	3	0	0	3
4.	MEC231	Kinematics of Machines	3	0	0	3
5.	MEC232	Manufacturing Technology-I	3	0	0	3
6.	ARP204	Aptitude Reasoning and Business Communication Skills-Intermediate	1	0	0	1
7.	OE I	Open Elective I	3	0	0	3
Practical/Viva-Voce/Jury						
8.	MEP230	Solid Mechanics Lab	0	0	2	1
9.	MEP229	Fluid Mechanics Lab	0	0	2	1
10.	MEP232	Manufacturing Technology-I Lab	0	0	2	1
11.	ARP204	Aptitude Reasoning and Business Communication Skills-Intermediate	0	0	2	1
12.	MEP252	Project Based Learning-2	0	0	2	1
13.	ECC301	Community Connect	-	-	-	2
TOTAL CREDITS						**26**
Summer Internship II conducted after IV term to be evaluated in V term						

School of Engineering and Technology

B.Tech-Mechanical Engineering

Batch: 2019-2023

TERM: V

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
THEORY SUBJECTS						
1.	MEC340	Dynamics of Machines	3	0	0	3
2.	PE I	Program Elective I	3	0	0	3
3.	MEC331	Machine Design	3	0	0	3
4.	MEC332	Heat Transfer	3	0	0	3
5.	ARP301	Quantitative Aptitude Behavioral and Interpersonal Skills	1	0	0	1
6.	OE II	Open Elective II	3	0	0	3
Practical/Viva-Voce/Jury						
7.	ARP301	Quantitative Aptitude Behavioural and Interpersonal Skills	0	0	2	1
8.	MEP340	Dynamics of Machines Lab	0	0	2	1
9.	MEP332	Heat Transfer Lab	0	0	2	1
10	MEP356	Technical Enhancement Course I	0	0	2	1
11	MEP351	Project Based Learning 3	0	0	2	1
12	MEP396	Industrial Internship II	-	-	-	1
TOTAL CREDITS						**22**

School of Engineering and Technology

B.Tech- Mechanical Engineering (Automobile Engineering)

Batch: 2019-2023

TERM: V

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
THEORY SUBJECTS						
1.	MEC314	Automotive Transmission	3	0	0	3
2.	MEC333	Hydraulics and Pneumatics	3	0	0	3
3.	PE I	Program Elective I	3	0	0	3
4.	MEC331	Machine Design	3	0	0	3
5.	MEC332	Heat Transfer	3	0	0	3
6.	ARP301	Quantitative Aptitude Behavioural and Interpersonal Skills	1	0	0	1
7.	OE II	Open Elective II	3	0	0	3
Practical/Viva-Voce/Jury						
8.	ARP301	Quantitative Aptitude Behavioural and Interpersonal Skills	0	0	2	1
9.	MEP333	Hydraulics and Pneumatics	0	0	2	1
10.	MEP332	Heat Transfer Lab	0	0	2	1
11.	MEP356	Technical Enhancement Course I	0	0	2	1
12.	MEP351	Project Based Learning 3	0	0	2	1
13.	MEP396	Industrial Internship II	-	-	-	1
TOTAL CREDITS						**25**

School of Engineering and Technology

B.Tech- Mechanical Engineering (Mechatronics)

Batch: 2019-2023

TERM: V

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
THEORY SUBJECTS						
1.	ECE 093	Digital Electronics	3	0	0	3
2.	PE I	Program Elective I	3	0	0	3
3.	MEC331	Machine Design	3	0	0	3
4.	MEC 334	CNC Technology	3	0	0	3
5.	ARP301	Quantitative Aptitude Behavioral and Interpersonal Skills	1	0	0	1
6.	OE II	Open Elective II	3	0	0	3
Practical/Viva-Voce/Jury						
7.	ARP301	Quantitative Aptitude Behavioral and Interpersonal Skills	0	0	2	1
8.	ECP093	Digital Electronics Lab	0	0	2	1
9.	MEP 398	Automation Lab	0	0	4	2
10.	MEP 356	Technical Enhancement Course I	0	0	2	1
11.	MEP 351	Project Based Learning 3	0	0	2	1
12.	MEP 396	Industrial Internship II	-	-	-	1
TOTAL CREDITS						**23**

School of Engineering and Technology

B.Tech-Mechanical Engineering

Batch: 2019-2023

TERM: VI

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
THEORY SUBJECTS						
1.	MEC335	Turbo Machinery	3	0	0	3
2.	MEC336	IC Engines	3	0	0	3
3.	PE II	Program Elective II	3	0	0	3
4.	PE III	Program Elective III	3	0	0	3
5.	PE IV	Program Elective IV	3	0	0	3
6.	OE III	Open Elective III	3	0	0	3
7.	ARP302	Higher Order Mathematics and Advance People Skills	1	0	0	1
Practical/Viva-Voce/Jury						
8.	MEP336	IC Engine Lab	0	0	2	1
9.	MEP335	Turbo Machinery Lab	0	0	2	1
10	PE II	Program Elective II Lab	0	0	2	1
11	MEP 397	CNC Lab	0	0	2	1
12.	ARP302	Higher Order Mathematics and Advance People Skills	0	0	2	1
13.	MEP357	Technical Skills Enhancement Course 2	0	0	2	1
14.	MEP352	Project Based Learning 4	0	0	2	1
TOTAL CREDITS						**26**
Summer Internship III conducted after VI term to be evaluated in VII term						

School of Engineering and Technology

B.Tech- Mechanical Engineering (Automobile Engineering)

Batch: 2019-2023

TERM: VI

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
THEORY SUBJECTS						
1.	MEC336	IC Engines	3	0	0	3
2.	PE II	Program Elective II	3	0	0	3
3.	PE III	Program Elective III	3	0	0	3
4.	PE IV	Program Elective IV	3	0	0	3
5.	OE III	Open Elective III	3	0	0	3
6.	ARP302	Higher Order Mathematics and Advance People Skills	1	0	0	1
Practical/Viva-Voce/Jury						
7.	MEP336	IC Engine Lab	0	0	2	1
8.	PE II	Program Elective II Lab	0	0	2	1
9.	MEP360	Automobile Engineering Lab	0	0	4	2
8.	ARP302	Higher Order Mathematics and Advance People Skills	0	0	2	1
10.	MEP357	Technical Skills Enhancement Course 2	0	0	2	1
11.	MEP352	Project Based Learning 4	0	0	2	1
TOTAL CREDITS						**23**
Summer Internship III conducted after VI term to be evaluated in VII term						

School of Engineering and Technology

B.Tech- Mechanical Engineering (Mechatronics)

Batch: 2019-2023

TERM: VI

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
THEORY SUBJECTS						
1.	ECE092	Control System Engineering	3	0	0	3
2.	MEC337	Applied Hydraulics & Pneumatics	3	0	0	3
3.	PE II	Program Elective II	3	0	0	3
4.	PE III	Program Elective III	3	0	0	3
5.	PE IV	Program Elective IV	3	0	0	3
6.	OE III	Open Elective III	3	0	0	3
7.	ARP302	Higher Order Mathematics and Advance People Skills	1	0	0	1
Practical/Viva-Voce/Jury						
8.	MEP337	Applied Hydraulics & Pneumatics	0	0	2	1
9.	ECE092	Control System Engineering	0	0	2	1
10.	PE II	Program Elective II Lab	0	0	2	1
11.	ARP302	Higher Order Mathematics and Advance People Skills	0	0	2	1
12.	MEP357	Technical Skills Enhancement Course 2	0	0	2	1
13.	MEP352	Project Based Learning 4	0	0	2	1
TOTAL CREDITS						**25**
Summer Internship III conducted after VI term to be evaluated in VII term						

School of Engineering and Technology

B.Tech-Mechanical Engineering

Batch: 2019-2023

TERM: VII

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
THEORY SUBJECTS						
1.	PE V	Program Elective V	3	0	0	3
2.	PE VI	Program Elective – VI	3	0	0	3
3.	OE IV	Open Elective – IV	3	0	0	3
4.	ARP 401	Problem solving creative thinking and leadership skills	1	0	0	1
Practical/Viva-Voce/Jury						
5.	ARP 401	Problem solving creative thinking and leadership skills	0	0	2	1
6.	MEP495	Industrial Internship III	-	-	-	1
7.	MEP463	Major Project-I	0	0	6	3
TOTAL CREDITS						**15**

School of Engineering and Technology

B.Tech-Mechanical Engineering

Batch: 2019-2023

TERM: VIII

S. No.	Course Code	Course	Teaching Load			Credits
			L	T	P	
Practical/Viva-Voce/Jury						
1.	MEP464	Major Project-II	0	0	16	8
TOTAL CREDITS						**8**

List of Program Electives: B.Tech Mechanical Engineering		
MEC221-Manufacturing Technology-II	MEC330 - Operations Research	MEC328 - Computer Integrated Manufacturing Systems
MEC411 - Refrigeration & Air Conditioning	MEC341 - Additive Manufacturing	MEC417- Introduction to Robotics Engineering
MEC426 - Industrial Engineering	MME122 - Finite element method using MAT Lab	MEC342 Energy Conservation and Management
MEC441 Gas Turbine and Compressor	MEC442 Maintenance Engineering	MEC410 Power Plant Engineering

List of Program Electives: B.Tech- Mechanical Engineering with Specialization in Automobile Engineering		
MEC329 - Automotive Electrical and Electronics	MEC330 - Operations Research	MEC315 - Mechanical Vibrations
MEC313 - Alternate Fuels and Energy Systems	MEC341 - Additive Manufacturing	MEC420- Robot and its Applications
MEC432 - Modern Vehicle Technology	MME122 - Finite element method using MAT Lab	MEC342 Energy Conservation and Management
MEC441 Gas Turbine and Compressor	MEC442 Maintenance Engineering	MEC410 Power Plant Engineering

List of Program Electives: B.Tech- Mechanical Engineering with Specialization in Mechatronics		
MEC 312 Power Electronics	MEC 309- Design of Mechatronics System	ECE 002 Microcontrollers and Application
ECE 272 Sensors and Signal Processing	MEC 439 - Robotics and Machine Vision System	MEC 440 - Modelling and Simulation
MEC 426 - Industrial Engineering	MEC 341 - Additive Manufacturing	MEC 342 Energy Conservation and Management
MEC 441 Gas Turbine and Compressor	MEC 442 Maintenance Engineering	MEC 410 Power Plant Engineering

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: ALL		**Semester:1**
1	Course Code	**CSE113**
2	Course Title	Programming for problem solving
3	Credits	4
4	Contact Hours (L-T-P)	3-0-2
	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	
	Unit 1	**Logic Building**
	A	Flowchart: Elements, Identifying and understanding input/ output, Branching and iteration in flowchart
	B	Algorithm design: Problem solving approach(top down/bottom up approach)
	C	Pseudo Code : Representation of different construct, writing pseudo-code from algorithm and flowchart
	Unit 2	**Introduction to C Programming**
	A	Introduction to C programming language, Data types, Variables, Constants, Identifiers and keywords, Storage classes
	B	Operators and expressions, Types of Statements: Assignment, Control, jumping.
	C	Control statements: Decisions, Loops, break, continue
	Unit 3	**Arrays and Functions**
	A	Arrays: One dimensional and multi-dimensional arrays: Declaration,

		Initialization and array manipulation (sorting, searching).		
	B	Functions: Definition, Declaration/Prototyping and Calling, Types of functions, Parameter passing: Call by value, Call by reference.		
	C	Passing and Returning Arrays from Functions, Recursive Functions.		
	Unit 4	**Pre-processors and Pointers**		
	A	Pre-processors: Types, Directives, Pre-processors Operators (#,##,\) , Macros: Types, Use, predefined Macros		
	B	Pointer: Introduction, declaration of pointer variables, Operations on pointers: Pointer arithmetic, Arrays and pointers, Dynamic memory allocation.		
	C	String: Introduction, predefined string functions, Manipulation of text data, Command Line Arguments.		
	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.		
	B	Files: Introduction, concept of record, I/O Streaming and Buffering, Types of Files: Indexed file, sequential file and random file,		
	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.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	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		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: CS/EC/IT/EEE		Semester: II
1	Course Code	CHY111
2	Course Title	**Engineering chemistry**
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	1. Make it comprehended the importance of clean water. 2. Describe to the basic concepts of spectroscopy as described in the module content and is to teach getting of valuable information from the same to apply in various engineering applications. 3. To provide an introduction to the basic concepts in Electrochemistry and apply them to understand batteries and corrosion. 4. To equip the students with the knowledge of modern technologies i.e. nanotechnology and its various engineering applications.
6	Course Outcomes	Students will be able to understand : 1. Realize the importance of clean and healthy water by giving knowledge about water quality parameters and cleaning measures. 2. In sighting the structural features of material by having the knowledge of spectroscopic techniques. 3. State the main cause of corrosion and prevention measures. Name the components of galvanic cell and applies these to understand the batteries and corrosion of a metal. 4. Able to apply the basic information of engineering materials and their applications. 5. Able to have a basic knowledge of technology in modern days i.e. Nanotechnology and its various applications. 6. Have a thorough grounding in chemistry and a working knowledge of advanced chemistry.
7	Course Description	● The course includes the fundamentals of Thermodynamics, Electrochemistry and batteries, corrosion, introduction to Chemistry of Materials, water technology and nanotechnology. This course satisfies the requirements of the Engineering program.
8	Outline syllabus	

	Unit 1	**Water: Analysis and its treatment**
	A	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,
	B	Hardness (definition and expression, estimation of hardness (EDTA method), nutrients (N, P, etc.), nitrate, dissolved metals.
	C	Municipal water treatment process - screening, sedimentation, flocculation; Coagulation, Filtration (Slow sand and rapid sand), disinfection-chlorination.
	Unit 2	**Spectroscopic studies of materials**
	A	Principles of spectroscopy and selection rules. Electronic spectroscopy: basic principle, 'Lamberts Beer's law,
	B	chromophore, effect of conjugation on chromophore and applications, Fluorescence and its applications in medicine.
	C	Basic principle and applications of Nuclear magnetic resonance and magnetic resonance imaging spectroscopy.
	Unit 3	**Electrochemistry, energy storage devices and corrosion**
	A	Electrochemistry: Redox reactions, Nernst Equation, relation of e.m.f. with thermodynamic functions (ΔH, ΔF and Δ S). Electrochemical cells-
	B	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,
	C	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 electrochemical corrosion.
	Unit 4	**Chemistry of materials**
	A	: 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.
	B	Organic and inorganic semiconductors. Basic concepts of Conducting polymer, types, p-doping, n-doping, comparison with metallic conductors, examples and applications.
	C	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**
	A	Introduction to Nano science and technology, bio-Nano information,
	B	lithography, soft lithography, Dip pen nanolithography, CNT's

	C	Application of nanotechnology in microelectronics and in memory devices.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	i. Puri, B.R., Sharma, L.R., and Pathania, M.S., "Principles of Physical Chemistry", Vishal publishing company. i. Bahl Arun, Bahl B.S. and J.D Tuli, "Essentials of Physical Chemistry", S.Chand & Co. i. University chemistry, by B. H. Mahan v. Chemistry: Principles and Applications, by M. J. Sienko and R. A.Plane v. Fundamentals of Molecular Spectroscopy, by C. N. Banwell i. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe,Kamaluddin and M. S. Krishnan i. Physical Chemistry, by P. W. Atkins i. Introduction to nanotechnology: C.P poole,Jr. F.J. Owens, willeyinterscience 2003. x. Nanotechnology, science, innovation and opportunity, LE foster,Pearson education 2007.		
	Other References	i. Collings, P.J., "Liquid Crystals", Princeton University Press.O.P. Vermani, A.K. Narula, "Industrial chemistry", GalgotiaPublications.		

School: SET			**Batch :2019-2023**	
Program: B.Tech			**Current Academic Year: 2019-2020**	
1	**Course number**		**FEN101**	
2	Course Title		**Functional English-**Beginners 1	
3	Credits		1	
4	Contact Hours (L-T-P)		0-0-2	
5	Course Objective		To equip students to minimize the linguistic barriers emerging in a different environment. Help students to understand different accents and standardise their existing English Guide the students to hone the basic communication skills, listening, speaking and reading.	
6	Course Outcomes		Students would be able to: CO1. Listen and interpret main ideas to differentiate between opinions and facts. CO2. Develop over all comprehension ability CO3. Learn to use correct sentence structure and punctuation CO4. Learn the correct use of new words CO5. Reading paragraphs fluently with a recognition of parts of speech. CO6. Recognise stress patterns in pronunciation of the English sentences CO7. To be able to speak confidently in the English language CO8. Cultivate and develop reading habits	
7	Outline syllabus: **Functional English-I**			**Ref. & Chapter**
7.01	FEN101.A	Unit A	**Sentence Structure**	
7.02	FEN101.A1	Unit A Topic 1	Activities based on Subject Verb Agreement	Ref 1: Chapter 3 (pp 79-99) : Ref 2
7.03	FEN101.A2	Unit A Topic 2	Activities based on parts of speech	Ref 1: Chapter 2 (pp 18-50) ;Ref 2
7.04	FEN101.A3	Unit A Topic 3	Writing well-formed sentences	Ref 1: Chapter 5 (pp 165-189) ; Ref 2
7.05	FEN101.B	Unit B	**Vocabulary Building and Punctuation**	
7.06	FEN101.B1	Unit B Topic 1	Homonyms/ homophones	Ref 1: Chapter 8 (pp 226) ; Ref 2
7.07	FEN101.B2	Unit B Topic 2	Synonyms/Antonyms	Ref 1: Chapter 8 (pp 216-217); Ref 2
7.08	FEN101.B3	Unit B Topic 3	Punctuation	Ref 1: Chapter 3 (pp 127-131) : Ref 2
7.09	FEN101.C	Unit C	**ReadingComprehension**	

7.10	FEN101.C1	Unit C Topic 1	Scanning based passages	Ref 1: Chapter 16 (pp 360-364)
7.11	FEN101.C2	Unit C Topic 2	Skimming based passages	Ref 1: Chapter 11 (pp 360-364)
7.12	FEN101.C3	Unit C Topic 3	Comprehension and Vocabulary based exercises	Ref 2:
7.13	FEN101.D	Unit D	**Speaking Skill**	
7.14	FEN101.D1	Unit D Topic 1	**Team Presentation**	Ref 1: Chapter 11 (pp 276-283)
7.15	FEN101.D2	Unit D Topic 2	Extempore	Ref 1: Chapter 14 (pp 315-317)
7.16	FEN101.D3	Unit D Topic 3	Roleplay of different situations	Ref 1: Chapter 14 (pp 351-352)
7.17	FEN101.E	Unit E	**Reading texts**	
7.18	FEN101.E1	Unit E Topic 1	The Thief by Ruskin Bond (short story)	Ref 2:
7.19	FEN101.E2	Unit E Topic 2	**The Hack Driver By Sinclair Lewis (**short story)	Ref 2:
7.20	FEN101. E3	Unit E Topic 3	Texts based discussions	Ref 2:
8	**Course Evaluation**			
8.1	Course work:30%			
8.2	Attendance	None		
8.3	Homework	10 assignments, no weight		
8.4	Quizzes	7 best quizzes (based on assignments); 20 marks		
8.5	Lab			
8.6	Presentations	None		
8.7	Any other	None		
8.9	MTE	One,20%		
8.10	End-term Examination: One,50%			
9	References			
	Text book	Workbook for Beginners		
	Other references	• Blum, M. Rosen. *How to Build Better Vocabulary*. London: Bloomsbury Publication		
		• Comfort, Jeremy(et.al). *Speaking Effectively*. Cambridge University Press		

School: SET		**Batch :2019-2023**		
Program: B.Tech		**Current Academic Year: 2019-2020**		
1	Course number	**FEN103**		
2	Course Title	**Functional English Intermediate-1**		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
5	Course Pre-requisite	A skill-based course designed for undergraduate students with basic understanding of English language		
6	Course Objective	To guide students to hone the basic communication skills: listening, speaking, reading and writing. To equip students to minimize the linguistic and socio-cultural barriers emerging in a different environment. To help students to understand different accents and standardise their existing English.		
7	Course Outcomes	Students would be able to: CO1: Demonstrate effective communication skills through listening, speaking, reading and writing CO2: Recognize and apply vocabulary and grammatical knowledge to express thoughts and actions CO3: Identify and express relevant information CO4:Exhibit comprehension ability CO5: Formulate correct sentence structure to develop technical/creative writing skills CO6: Critically evaluate arguments in terms of the strength of evidence and reasoning for creative writing CO7: Communicate effectively through strong conversational skills CO8: Appreciate true human feelings and life events		
8	Outline syllabus: **Functional English Intermediate-1 (FEN103)**			
			TOPICS	**Ref. & Chapter**
	FEN103 .A	**UNIT A**	**LISTENING**	
8.01	FEN103 .A1	Topic1	Appreciative Listening and Pronunciation: "Jabborwocky" by Lewis Carrol (audio)	Ref 1: Chapter 9 (pp 248 to 255); Ref 4
8.02	FEN103 .A2	Topic2	Informative Listening (Comprehension): TEDGlobal 2010 · Filmed July 2010 · 18:10 (Lecture by Johan Rockstrom: Let the environment guide our	Ref 1: Chapter 9 (pp 248 to 255); Ref 5

			development)	
8.03	FEN103.A3	Topic3	Critical Listening: President Obama Delivers the Commencement Address at Harvard University	Ref 1: Chapter 9 (pp 248 to 255); Ref 6
	FEN103.B	**UNIT B**	**READING AND DISCUSSION**	
8.04	FEN103.B1	Topic1	Reading the script: Lecture by Johan Rockstrom: "Let the Environment Guide our Development"	Ref 1: Chapter 16 (pp 355 to 373); Ref 5
8.05	FEN103.B2	Topic2	Reading Text: R. K. Narayan's "An Astrologer's Day" from Malgudi Days.	Ref 1: Chapter 16 (pp 355 to 373); Ref 7
8.06	FEN103.B3	Topic3	Reading Essays: *Humanistic and Scientific Approaches to Human Activities* by Moody E. Prior *Mother of Sciences* by A.J.Bahm *Social Function of Literature* by Ian Watt	Ref 2: Chapter 13 (pp 445 to 447); (pp 451 to 453); (pp 456 to 458)
	FEN103.C	**UNIT C**	**TECHNICAL WRITING**	
8.07	FEN103.C1	Topic1	Note-Making (based on A2 & B1)	Ref 1 Chapter 9 (pp 255); Ref 5
8.08	FEN103.C2	Topic2	Paraphrasing (based on A1 & B3)	Ref 1: Chapter 18 (pp 394); Ref 4 & 2
8.09	FEN103.C3	Topic3	Summarising (based on A1, B2 & B3); Précis Writing (based on B3)	Ref 1: Chapter 18 (pp 393); Ref 2; Ref 7

	FEN103.D	**UNIT D**	**ESSAY WRITING (THROUGH READING ESSAYS)**		
8.10	FEN103.D1	Topic1	Descriptive	Ref 1: Chapter 21 (pp 460 to 465); Ref 2: Chapter 13 (pp 445 to 447); (pp 451 to 453); (pp 456 to 458)	
8.11	FEN103.D2	Topic2	Expository		
8.12	FEN103.D3	Topic3	Argumentative		
	FEN103.E	**UNIT E**	**VOCABULARY BUILDING AND GRAMMAR (THROUGH READING AND LISTENING THE TEXTS)**		
8.13	FEN103.E1	Topic1	Word Formation; Antonyms and Synonym; One word Substitution; Homophones, Homonyms and Homographs; Adverbs and Adjectives as modifiers; irregular verbs; Prepositions	Ref 3	
8.14	FEN103.E2	Topic2	Modal; Tenses; Reported speech; Conditional sentences; Passives; Question tags; Giving Opinions; Expressing Likes, Dislikes and Desire; Explaining Advantages and Disadvantages		
8.15	FEN103.E3	Topic3	Spellings and Punctuation		
9	**Course Evaluation**				
9.1	Course work: 30%				
9.2	Attendance	None			
9.3	Homework	10 assignments, no weight			
9.4	Quizzes	6 best quizzes (based on assignments); 20 marks			
9.5	Lab	Separate			
9.6	Presentations	None			
9.7	Any other	None			
9.9	MTE	One, 20%			

9.10	End-term Examination: One, 50%	
10	Reference Books, Videos and Internet:	
	Text book	1. Communication Skills by Sanjay Kumar and PushpLata, OUP Publications. 2. Professional Communication by Meenakshi Raman and Sangeeta Sharma, OUP Publications. 3. Functional English Workbook (Intermediate)1
	Videos and Internet	4. 4. THE POEM "JABBERWOCKY" (https://www.youtube.com/watch?v=Q_Um3787fSY) 5. 5. TEDGlobal 2010 (http://www.ted.com/talks/johan_rockstrom_let_the_environment_guide_our_development) 6. Critical Listening: President Obama Delivers the Commencement Address at Harvard University (https://www.youtube.com/watch?v=_K4MctEmkmI) 7. An astrologer's day by R.K. Narayanan (http://danielleharms.wikispaces.com/file/view/%2522An+Astrologer%27s+Day%2522.pdf)
	Reference Books	6. Wren, P.C.&Martin H. High English Grammar and Composition, S.Chand& Company Ltd, New Delhi. 7. Murphy's English Grammar with CD, Cambridge University Press.

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: ME, EC, EE, CE		**Semester: I**
1	Course Code	MTH141
2	Course Title	CALCULUS, ANALYSIS AND LINEAR 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 calculus, multivariate analysis 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 by using Method of Lagrange. (K2,K3, K4) CO2: Explain the concept of integral calculus, describe Beta and Gamma function, calculatemultiple integration and evaluate area and volume. (K1, K2, K3, K4, K5) CO3:Describe the concept of sequence and series;discuss the test of convergence to evaluate convergence of series. (K1, K2, K3, K5) CO4: Discuss the basic of vector calculus; illustrate gradient, curl and divergence. (K1, K3) CO5: Describe and use the concepts line and surface integral for scalar and vector, explain the Green theorem. (K1,K2,K3, K4) CO6: Explain the basic concepts matrices and determinate, evaluate system of linear equation by using rank and inverse method, calculate Eigen values and Eigen vectors; Diagonalization of matrices; Cayley - Hamilton Theorem.(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, sequence and series, vector calculus and linear algebra.
8	**Outline Syllabus**	**Calculus, Analysis And Linear Algebra**
	Unit 1	**Differential Calculus**
	A	CO1
	B	Limits and continuity for multivariable and Partial derivatives, Euler's theorem total derivative; Tangent plane and normal line (basic concepts);

	C	Expansion of functions of several variables, Maxima, minima and saddle points; Method of Lagrange multipliers.		
	Unit 2	**Integral Calculus**		
	A	Beta and Gamma functions and their properties; Multiple Integration: Double integrals (Cartesian), change of order of integration in double integrals,		
	B	Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass,		
	C	Triple integrals (Cartesian), Simple applications of triple integration.		
	Unit 3	**Sequences and series**		
	A	Convergence of sequence and series,		
	B	tests for convergence: comparison test, D' Alembert's ratio test,		
	C	Raabe's test, Cauchy root test; Power series.		
	Unit 4	**Vector Calculus**		
	A	Gradient, curl and divergence, Scalar line integrals,		
	B	vector line integrals, scalar surface integrals,		
	C	Vector surface integrals, Theorems of Green's theorem.		
	Unit 5	**Matrices**		
	A	Inverse and rank of a matrix, System of linear equations,		
	B	Symmetric, skew-symmetric and orthogonal matrices; Determinants		
	C	Eigen values and Eigen vectors; Diagonalization of matrices; Cayley - Hamilton Theorem.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Kreyszig, E., "Advanced Engineering Mathematics", John Wiley & Sons Inc. 1. Jain, M.K., and Iyengar, S.R.K., "Advanced Engineering Mathematics", Narosa Publications		
	Other References	1. Thomas, B.G., and Finny R.L., "Calculus and Analytical geometry", Pearson Education Asia, Adison Wisley. 2. Simmons, G.F., "Differential Equations with applications with applications", Tata McGraw-Hill.		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: CE		**Semester: II**
1	Course Code	MTH144
2	Course Title	DIFFERENTIAL EQUATIONS, SPECIAL TRANSFORMS 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 prospective engineers with techniques in multivariate integration, ordinary and partial differential equations and statistical model. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.
6	Course Outcomes	CO1: Explain the concept of differential equations, illustrate thesecond order linear differential equations with constant coefficients, and use power series solution. (K2,K3, K4) CO2: Explain the concept of partial differential equation, describe method of separation of variables, and evaluate wave equation, heat equation and Laplace equation using method of separation of variables. . (K1, K2, K3, K4, K5) CO3:Describe Laplace transform and Z Transform;discuss Inverse Laplace transform and evaluate Convolution theorem. (K1, K2, K3, K5) CO4: Discuss the basic of Probability; illustrate Probability distributions; evaluate second degree parabolas and more general curves by using Curve fitting by the method of least squares. (K1, K3, K5) CO5: Describe and use the concepts Moments, Skewness and Kurtosis; evaluate correlation and regression, rank correlation. (K1,K2,K4, K5) 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	The primary objective of the course is to develop the basic understanding ofdifferential equations, special transforms and statistics.
8	**Outline syllabus :Differential Equations, Special Transforms And Statistics**	
	Unit 1	**Ordinary differential equations**
	A	Exact differential equations, Second order linear differential equations with constant coefficients,
	B	Method of variation of parameters, Cauchy-Euler equation; Power series

		solutions;		
	C	Legendre polynomials, Bessel functions of the first kind and their properties.		
	Unit 2	**Partial differential equations**		
	A	Definition, classification of partial differential equation, method of separation of variables		
	B	Solution of wave equation,		
	C	Heat equation and Laplace equation using method of separation of variables.		
	Unit 3	**Laplace Transform and Z Transform**		
	A	Laplace transform of some standard functions and its properties		
	B	Inverse Laplace transform and Convolution theorem		
	C	Introduction to Z transforms.		
	Unit 4	**Probability and Statistics I**		
	A	Probability, Random variables, Expectation of Random Variables		
	B	Probability distributions: Binomial, Poisson, Normal distribution		
	C	Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves		
	Unit 5	**Probability and Statistics II**		
	A	Moments, Skewness and Kurtosis,		
	B	Correlation and regression, Rank correlation		
	C	Tests of small samples- Student's T test, Chi-square test for goodness of fit.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006. 2. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.		
	Other References	1 Biostatistics, Wayne W. Daniel, John Wiley & sons, Inc., reprint: Wiley India, New Delhi. 2. Probability and Statistics for Engineers and Scientists, Walpole R. E., Mayers R. H., S. I., Ye. K. 7th Edition, Pearson, 2002. 3. Statistics for Biologists, Campbell R. C., Cambridge University Press 1988. The Principles of Scientific Research, Freedman P., Pergamon Press, New York.		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: CSE		**Semester: II**
1	Course Code	CSE114
2	Course Title	Application Based Programming in Python
3	Credits	4
4	Contact Hours (L-T-P)	3-0-2
	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. 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 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	
	Unit 1	**Introduction**
	A	History, Python Environment, Variables, Data Types, Operators.
	B	**Conditional Statements:** If, If- else, Nested if-else. **Looping:** For, While, Nested loops.
	C	**Control Statements:** Break, Continue, And Pass. Comments
	Unit 2	**List, Tuple and Dictionaries**
	A	**Lists and Nested List:** Introduction, Accessing list, Operations, Working with lists, Library Functionand Methods with Lists.
	B	**Tuple:** Introduction, Accessing tuples, Operations, Working, Library Functions and Methods with Tuples.
	C	**Dictionaries :**Introduction, Accessing values in dictionaries, Working with dictionaries, LibraryFunctions
	Unit 3	**Functions and Exception Handling**
	A	**Functions:** Defining a function, Calling a function, Types of functions, Function Arguments

	B	Anonymous functions, Global and local variables		
	C	**Exception Handling**: Definition Exception, Exception handling Except clause, Try? finally clause		
	Unit 4	**OOP and File Handling**		
	A	**OOPs concept** : Class and object, Attributes, Abstraction, Encapsulation, Polymorphism and Inheritance		
	B	Static and Final Keyword, Access Modifiers and specifiers, scope of a class		
	C	User Defined Exceptions		
	Unit 5	**Module and Applications**		
	A	**Modules:** Importing module, Math module, Random module		
	B	Matplotlib, Packages		
	C	**Applications: Searching Linear Search, Binary Search. Sorting: Bubble Sort**		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	3. The Complete Reference Python, Martin C. Brown, McGrwHill		
	Other References	1. Introduction to computing in problem solving using Python, E Balahurusamy, McGrwHill 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		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch:All		Semester: II
1	Course Code	CEP114
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	
	Unit 1	Practical based on conditional statements and control structures
		1. Program to implement all conditional statements 2. Program to implement different control structures
	Unit 2	Practical related to List, Tuples and ictionaries
		1. Program to implement operations on lists 2. Program to implement operations on Dictionary 3. Program to implement operations on Tuple
	Unit 3	Practical related to Functions and Exception Handling
		1. Program to implement Exception Handling 2. Program to use different functions
	Unit 4	Practical related to Object Oriented Programming
		Program to use object oriented concepts like inheritance, overloading polymorphism etc.

		Program for file handling		
	Unit 5	Practical related to Modules and Applications		
		Program to use modules and package 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, McGrwHill		
	Other References	5. Introduction to computing in problem solving using Python, E Balahurusamy, McGrwHill 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		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch:		**Semester: I/II**
1	Course Code	EEE112
2	Course Title	Principles of Electrical and Electronics Engineering
3	Credits	3
4	Contact Hours (L-T-P)	2-1-0
	Course Status	Compulsory
5	Course Objective	To provide the students with an introductory concept in the field of electrical and electronics engineering to facilitate better understanding of the devices, techniques and equipments used in engineering applications.
6	Course Outcomes	CO1: To analyze and solve basic electrical circuits CO3: To understand the working principle of transformer and identify its applications. CO3: To understand the working principle of dc and ac motors and identify the starting methods of single phase induction motor CO4: To apply the basics of diode to describe the working of rectifier circuits such as half and full wave rectifiers CO5: To aapply the concepts of basic electronic devices to design various circuits
7	Course Description	This initial course introduces the concepts and fundamentals of electrical and electronic circuits and devices. Topics include basic circuit analysis, diode and transistor fundamentals and applications. This course also

		introduces working principle and applications of dc/ac motors and transformers.		
8	Outline syllabus			
	Unit 1	**DC & AC Circuits (6 lectures)**		
	A	Electrical circuit elements (R, L and C), series and parallel circuits, concept of equivalent resistance, Kirchhoff current and voltage laws, star-delta conversion		
	B	Analysis of simple circuits with dc excitation and Superposition Theorem, Representation of sinusoidal waveforms, peak and rms values, real power, reactive power, apparent power, power factor		
	C	Introduction to three phase system, relationship between phase voltages and line voltages,		
	Unit 2	**Transformer(4 lectures)**		
	A	Working principle and construction of transformer, EMF equation		
	B	Efficiency of transformer, Power and distribution transformer and difference between them		
	C	Transformer applications in transmission and distribution of electrical power		
	Unit 4	**Electrical Motors (6 lectures)**		
	A	Construction, working principle, torque-speed characteristic and applications of dc motor.		
	B	Construction, working principleand applications of a three-phase induction motor, significance of torque-slip characteristic		
	C	Working principle starting methods and applications of single phase induction motor		
	Unit 4	**Semiconductor Diode and Rectifier (5 lectures)**		
	A	PN junction and its biasing		
	B	Semiconductor diode, ideal versus practical diode , VI characteristics of diode		
	C	Half wave and full wave rectifiers with and without filters.		
	Unit 5	**Transistors (5 lectures)**		
	A	Bipolar Junction Transistor (BJT) –Construction, working principle and input-output characteristics		
	B	BJT as CE amplifier and as a switch		
	C	Introduction to JFET		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010. 2. S. K. Bhattacharya, “Basic Electrical and Electronics Engineering”,		

		Pearson Publication. 3. Robert L Boylestad, “Electronic Devices and Circuit Theory” Pearson Education, 2009
	Other References	1. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

SCHOOL OF ENGINEERING &TECHNOLOGY		MECHANICAL ENGINEERING	II TERM	FIRST YEAR
1	Course number	MEP201		
2	Course Title	Idea Generation and Creativity Lab		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
5	Course Objective	The objective of this course is to make the students understand the importance of creativity and innovation in engineering. Then course will enable students to generate better creative ideas and observation skills.		
6	Course Outcomes	On successful completion of this course students will be 1. Students will understand the importance of creativity in solving complex problems 2. Students will improve observation skills through an understanding of creativity models. 3. Students will understand the process and tools of new design thinking.		
7	Outline syllabus			
7.01	Presentation	:	Presentation on creative ideas that changed the world/Case studies	
7.02	Idea presentation	:	On various engineering issues/deficiencies in existing product/propose new design for an existing product.	
7.03	Brainstorming session	:	Explore various ideas to tackle/list alternative solutions/challenges/ logical approach/what are the constraints/most economical	
7.04	Mock review	:	Mock review of the presentation (generating solutions and ideas in classroom through discussion)	
7.05	Discussion	:	Identifying and resolving the issues	
7.06	Final presentation	:	Final presentation detailing the solution to the selected problem/new modification.	
8	Course Evaluation			
8.1	Attendance	Each class has marks		
8.2	Project	To be completed by the end of semester		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: I**
1	Course Code	MEP107
2	Course Title	Introduction to Mechanical Engineering
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Basic Engineering
5	Course Objective	To introduce different discipline of mechanical engineering, motivate students to pursue a career in the field of mechanical engineering and to perform hands on practice on mechanical components.
6	Course Outcomes	After the successful completion of course students will be able to: CO1: Identify different areas of mechanical engineering and its application CO2:Demonstrate the working mechanism of internal combustion engine CO3: Apply the working principle of refrigeration system. CO4: Classify engineering materials and its application CO5: Classify different plant layouts
8	Outline syllabus	
	Unit 1	**Introduction**
	A	Definition of Mechanical Engineering,
	B	Various streams like production & Industrial engineering, thermal and design etc.
	C	Scope of mechanical Engineering. Career scope in Mechanical Engineering
	Unit 2	**Introduction to IC Engine and Refrigeration, Air conditioning**
	A	Introduction engine and its nomenclature.
	B	Working of 2 stroke and 4 stroke petrol and diesel engine
	C	Brief overview of transmission systems.
	Unit 3	**Introduction to Refrigeration, Air conditioning**
	A	History and scope of refrigeration, application of refrigeration, difference in refrigeration and heat pump
	B	Natural Refrigeration methods: Ice refrigeration, refrigeration by salt solution and evaporative cooling

	C	Name of Mechanical refrigeration systems and working of simple refrigeration system only.		
	Unit 4	**Engineering Materials**		
	A	Classification of Engineering Materials		
	B	Properties of engineering materials		
	C	Name and properties of smart materials		
	Unit 5	**Plant Layout**		
		Plant Layout: factors, principle, objective and procedure of plant layout		
		Advantages of good plant layout .Types of plant layout: process layout and product layout.		
		Overview of job mass and batch production, Industrial Safety Aspects		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. Foundations of Materials Science and Engineering, William F. Smith, Javad Hashemi, TMH Publication.		
	Other References	1. Fundaments of Internal Combustion Engine, V. Ganesan, TMH Publication 2. Refrigeration and Air Conditioning, P.K Nag, TMH Publication		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: ALL		**Semester: I**
1	Course Code	MEP106
2	Course Title	Computer Aided Design & Drafting Lab
3	Credits	1.5
4	Contact Hours (L-T-P)	0-0-3
	Course Status	Compulsory
5	Course Objective	The objective of this introductory course is to make students familiar with computer-aided drafting/ design, introduce them about the basic commands, tools and dimension techniques for creation and presentation of various engineering drawing by using AutoCAD software which helps in visualization and problem solving in engineering disciplines.
6	Course Outcomes	After successful completion of this course the student will be able to CO1: Identify the fundamental features of CAD, AutoCAD workspace and user interface. CO2: Apply the knowledge of drawing, editing, and viewing tool for creating two dimensional engineering drawings in AutoCAD. CO3: Choose advance features to present an engineering drawing in AutoCAD. CO4: Reframe an engineering drawing by implementing dimension techniques. CO5: Define and interpret different orthographic projections from a pictorial view.
7	Course Description	This introductory course is offered to students to make them proficient in design, layout, product development, and other careers that require technical drawing. Using the current version of the AutoCAD software, students will learn a variety of drawing techniques and be able to replicate specific drawings in multiple perspectives. The pinnacle of the class is to empower and enable students to create using the software provided. Career opportunities and 3-D modeling, manufacturing, and engineering will also be explored. No drafting or computer experience is necessary.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	Introduction to AutoCAD and its interface with assignment 1
	Experiment 2	Working with coordinates, Drawing of line, circle, arc, polygon and creating sketches by using them assignment 2
	Experiment 3	Editing of drawing by using editing Tools and Power tools with assignment

		3		
	Experiment 4	Creating of advanced feature like fillet, chamfer, hatch and using of reusable items with assignment 4		
	Experiment 5	Representing text and dimensioning in AutoCADwith assignment 5		
	Experiment 6	Creating the drawing of the given assignment 6 by using AutoCAD features.		
	Experiment 7	Creating the drawing of the given assignment 7 in AutoCAD.		
	Experiment 8	Creating the drawing of the given diagram and giving dimensions in AutoCAD.		
	Experiment 9	Creating the drawing of Tajmahal in AutoCAD 2D		
	Experiment 10	Creating of orthographic projections from a 3D figure		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. Ibrahim Zaid,"CAD/CAM- Theory and Practice", McGraw Hill, International Edition.		
	Software	AutoCAD		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: II
1	Course Code	MEP105
2	Course Title	**Mechanical Workshop**
3	Credits	1.5
4	Contact Hours (L-T-P)	0-0-3
	Course Status	Compulsory
5	Course Objective	The objective of this course is to make the students, familiar with the modern day manufacturing processes, introduce them to various hand tools and equipment, acclimatize with the measuring devices, and perform basic machine tool operations in various machine tools.
6	Course Outcomes	After successful completion of this course, students will be able to CO1: Apply 5S (Seiri,Seiton, Seiso,Seiketsu and Shitsuke) methodology at workplace. CO2: Select the various hand tools used in the basic mechanical engineering workshop sections-smithy, carpentry, assembling, welding etc. CO3: Choose different measuring devices according to the job CO4: Differentiate between various machine tools and their operation CO5: Classify and select suitable tools for machining processes including turning, facing, thread cutting and tapping, milling, drilling and shaping.
7	Course Description	**Black Smithy Shop:** Simple exercises based on black smithy operations such as upsetting, practice of S -Hook from circular bar using hand forging operations. **Carpentry Shop :** Study of different types of wood , Carpentry Tools, Equipment and different joints, Practice of T joint, cross lap joint, Mortise and Tenon T joint, Bridle T joint **Fitting Shop:** Preparation of Square joint, V joint, half round joint, dovetail jointas per the given specifications, which contains: Sawing, Filing, Grinding, and Practice marking operations. **Sheet Metal Shop:** Study of galvanized Iron (G.I.) Sheet material properties, hand tools and sheet metal machines, and projective geometry, demonstration of different sheet metal operations and practice of development of Tray, cylinder, hopper, funnel etc. **Welding Shop:** Introduction, Study of Tools and welding Equipment (Gas and Arc welding), Selection of welding electrode and current, Bead practice and Practice of Butt Joint, Lap Joint. **Machine Shop:** Study of machine tools in particular Lathe machine

		(different parts, different operations, study of cutting tools), Demonstration of different operations on Lathe machine, Practice of Facing, Plane Turning, step turning, taper turning, knurling and parting and Study of Quick return mechanism of Shaper. **Foundry Shop:** Introduction to foundry, Patterns, pattern allowances, ingredients of moulding sand and melting furnaces. Foundry tools and their purposes, Demo of mould preparation and Practice – Preparation of mould by using split pattern.		
8	Outline syllabus			
	List of Experiments			
	Experiment 1	To make a S shaped hook from a given circular rod using hand forging technique.		
	Experiment 2	To make a dovetail lap joint in Carpentry shop.		
	Experiment 3	To make a cross-half lap joint in Carpentry shop.		
	Experiment 4	To make a square fit from the given mild steel pieces in fitting shop.		
	Experiment 5	To prepare a V-Fit from the given mild steel pieces in fitting shop.		
	Experiment 6	To make a rectangular tray of specified dimensions in sheet metal shop.		
	Experiment 7	To make a Lap joint, using the given mild steel pieces using arc welding.		
	Experiment 8	To perform step turning and taper turning operations on the given work piece		
	Experiment 9	To prepare a sand mold, using the given single piece pattern		
	Experiment 10	To prepare a sand mold, using the given Split-piece pattern.		
	Mode of examination	Practical		
	Weight- age Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. Raghuwanshi B.S., Workshop Technology Vol. I & II, Dhanpath Rai & Sons. 2. Kannaiah P. and Narayana K.L., Workshop Manual, 2nd Edn, Scitech publishers. 3. John K.C., Mechanical Workshop Practice. 2nd Edn. PHI 2010. 4. Jeyapoovan T.and Pranitha S., Engineering Practices Lab Manual, 3rd Edn. Vikas Pub.2008.		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: BT		**Semester: 03**
1	Course Code	**BTY223**
2	Course Title	**INTRODUCTION TO BIOLOGY FOR ENGINEERS**
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	**Compulsory**
5	Course Objective	1. To acquire a fundamental knowledge of Biomolecules, genetics, immunology. 2. To understand the different concepts of plant animal and microbial systems. 3. To understand basic concepts of biremediation and biofetilizers.
6	Course Outcomes	CO1: To understand the fundamentals of living things, their classification, cell structure and biochemical constituents. CO2: To apply the concept of plant, animal and microbial systems and growth in real life situations. CO3: To comprehend genetics and the immune system. CO4 To know the cause, symptoms, diagnosis and treatment of common diseases. CO5: To give a basic knowledge of the applications of biological systems in relevant industries. CO6: Discuss various aspects of biological sytems and their significance in design of products.
7	Course Description	Students will be introduced to the functions and interactions of biological systems from a quantitative perspective. To provide a foundation in biology with engineering of living systems and to apply various tools of traditional engineering fields. To harness potential of living systems for the benefit of human mankind.
8	Outline syllabus	
	Unit 1	**UNIT I: INTRODUCTION TO LIFE**
	A	Characteristics of living organisms

	B	Cell theory		
	C	Structure of prokaryotic and eukaryotic cell		
	Unit 2	**UNIT II: Biomolecules**		
	A	General classification and important functions of carbohydrates and lipids		
	B	General classification and important functions of proteins		
	C	General classification and important functions of DNA and RNA		
	Unit 3	**UNIT III:Genetics and Immune system**		
	A	Theories of Evolution		
	B	Mendel's laws of inheritance		
	C	Immune system and Immunity		
	Unit 4	**UNIT IV: Human Diseases**		
	A	Genetic diseases and Infectious diseases		
	B	AIDS and Diabetes		
	C	Cancer and its causes		
	Unit 5	**UNIT V: Biology and its industrial application**		
	A	Vaccines and their types		
	B	Bioremediation and Biofertilizers		
	C	Bioreactors		
	Mode of examination	**Theory**/Jury/Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Karp, G. Cell and Molecular Biology, 5th ed., John Wiley and Sons, Inc.		
	Other References	Alberts, B. et al. Essential Cell Biology, Garland Publishing, Inc. (ISBN: 081533480X) 4. Berger, S. et al. Introduction to Bioengineering, Oxford University Press (ISBN: 978-0-19-856515-4)		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: CSE		**Semester: III**
1	Course Code	ARP203
2	Course Title	: Aptitude Reasoning and Business Communication Skills-Basic
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Status	
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 LSRWG and P (Listening Speaking Reading Writing Grammar and Pronunciation) | 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)
	A	Know Yourself: Core Competence. A very unique and interactive approach through an engaging questionnaire to

		ascertain a student's current skill level to design, architect and expose a student to the right syllabus as also to identify the correct TNI/TNA levels of the student.
	B	Techniques of Self Awareness | Self Esteem & Effectiveness|Building Positive Attitude | Building Emotional Competence
	C	Positive Thinking & Attitude Building | Goal Setting and SMART Goals – Milestone Mapping | Enhancing L S R W G and P (Listening Speaking Reading Writing Grammar and Pronunciation) | Verbal Abilities - 1
	Unit 2	Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical
	A	Syllogism | Letter Series | Coding, Decoding , Ranking & Their Comparison Level-1
	B	Number Puzzles
	C	Selection Based On Given Conditions
	Unit 3	Quantitative Aptitude
	A	Number Systems Level 1 | Vedic Maths Level-1
	B	Percentage ,Ratio & Proportion | Mensuration - Area & Volume |Algebra
	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

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: CSE		**Semester: IV**
1	Course Code	ARP204
2	Course Title	Aptitude Reasoning and Business Communication Skills-Intermediate
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Status	
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 2nd phase of employability enhancement and skill building activity exercise.
6	Course Outcomes	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
7	Course Description	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
8	Outline syllabus – ARP204	
	Unit 1	Communicate to Conquer
	A	VMOSA (Vision, Mission, Values and Ethics)|Business Communication - Verbal Communication Skills | Barriers in communication |Basics of effective communication – PRIDE Model

	B	Different styles of communication & style flexing (Based on the 4 social styles-Analytical, Driving, Expressive, Amiable) | Importance of Listening & practice of Active Listening |The Art of Giving Feedbacks| Feedback Skills | Asking fact finding questions- Probing Skills
	C	Email Etiquette | Business Writing Skills|Telephone Etiquette Skills (Telephone Handling Skills) |Non Verbal Communication-Kinesics, Proxemics, Paralanguage | MTI Reduction Program | Verbal Abilities - 2
	Unit 2	Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical
	A	Coding Decoding , Ranking & Their Comparison Level-2
	B	Series, Blood Relations & Number Puzzle
	Unit 3	Quantitative Aptitude
	A	Number System Level 2
	B	Vedic Maths Level-2 | Probability | Permutation & Combination
	C	Percentage, Profit & Loss ,Partnership, Simple Interest & Compound Interest
	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

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: III**
1	Course Code	MEC228
2	Course Title	Engineering Mechanics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1. To develop knowledge of Force and Moment of Force 2. To provide students an understanding of Addition and subtraction of forces and Moments of force 3. To calculate the reactive forces. 4. To develop knowledge of Friction 5. To develop an understanding of principle of virtual work 6. To teach students the kinematics of particle and rigid bodies
6	Course Outcomes	After the successful completion of course students will be able to: 1. Solve the engineering problems in case of equilibrium condition 2. Calculate the reaction forces of various supports of different structures 3. Apply the concept of static and dynamic friction in day to day life. 4. Describe the concept of energy, momentum and impulse. 5. Solve the problems involving dynamics of particles and rigid bodies 6. Analyze free and forced vibrations of mechanical system
7	Course Description	This course introduces the principles required to solve engineering mechanics problems. It addresses the modeling and analysis of static equilibrium problems with an emphasis on real-world engineering applications and problem solving
8	Outline syllabus	
	Unit 1	**Statics of Particle**
	A	Introduction to Mechanics – Fundamental Principles – Laws of Mechanics,–
	B	Lame's theorem, Parallelogram and triangular Law of forces, Coplanar forces
	C	Free body diagram – Equilibrium of particles - Equilibrium of particle in

		space		
	Unit 2	**Statics of Rigid Body and Friction**		
	A	Single equivalent force – Free body diagram – Types of supports and their reactions		
	B	Requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis –Varignon's theorem – Equilibrium of Rigid bodies in two dimensions.		
	C	Law of Coulomb friction, Simple contact friction problems, Transmission of power through belts, Belt Friction , Square Screw thread		
	Unit 3	**Dynamics of Particles**		
	A	Displacements, Velocity and acceleration, their relationship – relative motion —		
	B	Curvilinear motion – Newton's law – Work Energy Equation of particles		
	C	Impulse and Momentum – Impact of elastic bodies- Impact - direct and central impact – coefficient of restitution.		
	Unit 4	**Dynamics of Rigid Bodies**		
	A	General plane motion –Velocity and Acceleration- Absolute and Relative motion method -		
	B	Equilibrium of rigid bodies in plane motion- Newton's Law- D'Alembert's Principle-		
	C	Work Energy Principle-Principle of impulse momentum for rigid bodies in plane motion		
	Unit 5	**Vibrations**		
	A	Un-damped Free vibration, Un-damped Force vibration		
	B	Torsional vibration, Energy methods		
	C	Viscous Damped Free vibration, Viscous Damped Forced Vibrations		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Shames, I. H., 'Engineering Mechanics – Statics and Dynamics', Prentice-Hall Inc.,1980.		
	Other References	1. Lakshamna Rao, C., Lakshminarasimhan, J., Srinivasan R. S., Sivakumar M. S., Engineering Mechanics – Statics and Dynamics' Prentice Hall India, 2009. 2. Beer, F. P. & Johnston, E. R., "Vector Mechanics for Engineers Vol. I Statics & Vol. II- Dynamics", McGraw Hill International Edition Seventh Edition, 1997 3. J. L. Meriam and L. G. Kraige, 'Engineering Mechanics: Statics (Vol.1), Dynamics (Vol.2)', Fifth Ed., Wiley 2002. 4. R. C. Hibbler, Engineering Mechanics, Pearson Education, Tenth Ed.,2009.		

		5. MATLAB, Commercial software MDSolids. (https://www.mdsolids.com/download.htm)

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: III
1	Course Code	MEC227
2	Course Title	Basic Thermodynamics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	Development of an understanding of basic thermodynamics and to expose the students to the areas in which these fundamental can be applied e.g. thermodynamic systems for power plant, heat transfer, IC engine, automobile and many more.
6	Course Outcomes	After completion of this course, students will be able to: CO1 Demonstrate basic thermodynamic properties and thermodynamic systems. CO2 Apply first law of thermodynamics to closed and steady flow processes such as heat pump, refrigerators etc. CO3 Explain the concept of 2nd law of thermodynamics and its applications to real life problems. CO4 Evaluate entropy, exergy of various thermodynamic systems. CO5: Describe the concept of ideal gases, real gases and their applications in thermodynamics. CO6: Compare the Auto, Diesel, Brayton and Rankine cycles in context to their applications in Petrol engines, Diesel engines, steam turbines and gas turbines respectively.
7	Course Description	This course covers the principles of classical thermodynamics. Develops understanding of mass, energy, heat, work, efficiency, ideal and real thermodynamic cycles and processes. Teaches first and second laws of thermodynamics, perfect gas law, properties of real gases, and the general energy equation for closed and open systems.
8	Outline syllabus	
	Unit 1	**Introduction**
	A	Thermodynamic properties and state, cycles, systems and processes,
	B	Path and point functions, Thermodynamic equilibrium, Zeroth law, Thermometry.
	C	First law applied to closed systems and in various process
	Unit 2	**Application Of 1st law of thermodynamics in steady flow process**

	A	Concept of control volume, Concept of flow process		
	B	1st law of thermodynamic for steady flow process.		
	C	Application and numerical of 1st law thermodynamics.		
	Unit 3	**2nd law of thermodynamics.**		
	A	Kelvin-Planck and Clausius statements,Heat engines and heat pumps, Efficiency and COP.		
	B	Carnot Engine and cycle		
	C	Principle of entropy, Gibbs free energy, Available energy, Availability.		
	Unit 4	**Ideal and real gases and thermodynamic relations**		
	A	Ideal gas mixtures - property calculation,		
	B	Equation of state, Compressibility chart		
	C	Maxwell's equations, Clapeyron equation, Joule-Thomson coefficient		
	Unit 5	**Steam properties and thermodynamic cycle.**		
	A	Steam formation, Use of steam table.		
	B	Dryness fraction measurement, PVT surface		
	C	Otto cycle, Diesel cycle, Sterling cycle, Brayton cycle and Rankine cycle, Rankine cycle with regeneration.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Dr.Yunus A.Cengel and Dr.Michael A. Boles, " Thermodynamics - An Engines Approach ", Sixth Edition, McGraw Hill Ind., N.J., 2009		
	Other References	1.Moran & Shapiro, Fundamental of EngineeringThermodynamics, 5th Edition, John Willey & Sons. 2. Rogers & Mayhew, " Introduction to Thermodynamics." 3. Nag P.K., "Engineeering Thermodynamics,", Tata McGraw Hill (1995) 4. Download Thermofluid software from http://thermofluids.sdsu.edu/index.html		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: III**
1	Course Code	MEC225
2	Course Title	Material Science
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Compulsory
5	Course Objective	1. To develop knowledge of Crystals and Their imperfections. 2. To provide students an understanding of phase diagram ant its application in development of alloys. 3. To provide students an understanding of various Engineering materials, their properties, applications and causes of failure. 4. To develop an understanding of Failure of materials in application. 5. To teach students different tools used in material testing.
6	Course Outcomes	After successful completion of this course the students will be able to CO1. Explain the behaviour of metals and their alloys on account of crystallography, phase diagram, Fe-C diagram and TTT diagram. CO2. Classify various types of steel and cast iron. CO3. Determine the heat treatment method for alloys. CO4. Characterize the different non-ferrous materials and their alloys CO5. Decide the suitable polymers and ceramics for the Engineering application. CO6. Recommend the suitable material for various engineering applications.
7	Course Description	This course focuses on the different Engineering Materials, their structure, defects, manufacturing, properties, testing and application.
8	Outline syllabus	
	Unit 1	**Crystal Imperfections and Phase diagrams**
	A	Crystal Imperfections: Point Defects, Line Defects and Dislocations, Surface and Interfacial Defects and Bulk or Volume Defects
	B	Phase Rule, Equilibrium Phase Diagrams, Lever Rule, Hume-Rothery

		Phases.		
	C	Phase Systems - Isomorphous, Eutectic with No and Limited Solid Solubility and with Peritectic;		
	Unit 2	**Iron Carbon Diagram and Heat Treatment**		
	A	Iron-Carbon Phase Diagram,		
	B	TTT Diagram		
	C	Heat Treatment		
	Unit 3	**Ferrous Materials**		
	A	Manufacturing of iron. Types, Properties, Microstructures and Applications of Important Ferrous Materials.		
	B	Steels		
	C	Cast Irons		
	Unit 4	**Non-Ferrous Materials**		
	A	Types, Properties and Applications of Important Non-Ferrous Metals-Brasses, Bronzes, Bearing Metals		
	B	Phase changed materials for thermal storage,		
	C	nano materials.		
	Unit 5	**Fracture, Fatigue and Creep in materials**		
	A	Ductile and Brittle Fracture; Thermal Stresses; Modes of Fracture, Fracture Toughness; Ductile-Brittle Transition,		
	B	Types of Impact Testing, Fatigue, Crack Initiation and Propagation, S-N Curve,		
	C	Factors in Fatigue Life, Fatigue Testing, Creep, Stages of Creep Curve, Stress and Temperature Effects		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Callister Jr., W.D. and Balasubramaniam, R., Callister's Materials Science and Engineering, Wiley India, 2007.		
	Other References	1. Raghavan, V., Materials Science, 5th Ed., PHI Learning Pvt. Ltd., 2010		

School: SET		**Batch :2019-2023**		
Program: B.Tech		**Current Academic Year: 2019-2020**		
Branch: ALL		**Semester: III**		
1	Course Code	MEP225		
2	Course Title	Metrology Lab		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory		
5	Course Objective	The course covers the procedures needed to develop the concepts related to precision measurement, inspection and quality control		
6	Course Outcomes	After successful completion of this course the student will be able to CO1: Inspect the precision of engineering parts. CO2: Examine the gear tooth profile. CO3: Apply the statistical quality control. CO4: Calibrate the precision instruments.		
7	Course Description	The course covers the procedures needed to develop the concepts related to precision measurement, inspection and quality control		
8	Outline syllabus			
	List of Experiments			
	Experiment 1	Study of profile projector		
	Experiment 2	Measurement of internal diameter using micro meter		
	Experiment 3	Gear tooth thickness measurement using gear tooth Vernier		
	Experiment 4	Statistical quality control		
	Experiment 5	Precision measurement (measurement of angle with slip gauges)		
	Experiment 6	Calibration of dial gauge		
	Experiment 7	Calibration of LVDT		
	Experiment 8	Sine bar internal taper angle measurement		
	Experiment 9	Study of precision Instrument		
	Experiment 10	Calibration of dial gauge		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	Handouts given by the instructor		
	Software	-		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: IV
1	Course Code	MEC229
2	Course Title	Fluid Mechanics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1. Develop an understanding of the basic principles of fluid mechanics. 2. Apply skills in analysing fluid flows through the proper use of modeling and the application of the basic fluid-flow principles. 3. Provide some specific knowledge regarding fluid-flow phenomena observed in mechanical engineering systems, such as flow in a pipe, boundary-layer flows, drag, etc. 4. Analyse some fluid flow properties measuring equipment used in practice. 5. Analyze different kinds of fluid measuring instruments using software
6	Course Outcomes	On successful completion of this course, students will be able to: CO1: Illustrate fluid properties and basic law, principles of fluid Mechanics CO2: Apply basic law and principles of fluid Mechanics to find out the hydrostatic, buoyancy pressure forces. CO3: Analyze the motion of fluids by applying the fundamental equations of continuity, energy and momentum. CO4:Measure fluid flow discharge for discharge Measuring devices CO5:Apply similitude and modelling principles and techniques to solve problems in hydraulics. CO6:Apply the concept of boundary layer flow.
7	Course Description	This course introduces student's introduction to principal concepts and methods of fluid mechanics. Topics covered in the course include pressure, hydrostatics, and buoyancy; open systems and control volume analysis; mass conservation and momentum conservation for moving fluids; viscous fluid flows, flow through pipes; dimensional analysis; boundary layers, and lift and drag on objects. Students will work to formulate the models necessary to study, analyze, and design fluid systems through the application of these concepts, and to develop the problem-solving skills essential to good

		engineering practice of fluid mechanics in practical applications		
8	Outline syllabus			
	Unit 1	**Fluid properties & fluid statics**		
	A	Fluids and continuum, Fluid properties, Classification of fluids and regimes.		
	B	Pascal's law, Hydrostatic force on submerged plane and curved surface, Manometers.		
	C	Buoyancy, Metacentric height, Liquid in a container subjected to an acceleration and constant rotation.		
	Unit 2	**Fluid kinematics and fluid dynamics**		
	A	Descriptions of fluid flow, Types of fluid flow, Kinematics of fluid flow, Rotation & circulation acceleration in fluid flow, Streamlines, Integral form of continuity equation.		
	B	Integral momentum equation, Laminar flow through pipes and between parallel plates, Measurement of viscosity, Bernoulli's equations, Engineering Bernoulli equation and applications, Hydraulic gradient and Total energy line, Water hammer		
	C	Flow measurements.		
	Unit 3	**Similitude**		
	A	Basic concept of similitude, Various dimensionless numbers, Reynolds experiment.		
	B	Turbulent flow through pipes, Major and minor losses,		
	C	Pipes in series and parallel.		
	Unit 4	**Boundary layer flow**		
	A	Development of boundary layer		
	B	Boundary layer thickness and related details		
	C	Drag on a flat plate, Boundary layer separation and its control.		
	Unit 5	**Flow around immersed bodies**.		
	A	Flow past submerged bodies, Drag and lift, Streamlined and bluff bodies.		
	B	Flow around a circular cylinder and an aero foil,		
	C	Terminal velocity of a body, Introduction to compressible flow.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Yunus A. Cengel, Fluid Mechanics,McGrawHill Publishers, 2nd		

		edition
	Other References	2. Kumar K L, Engineering Fluid Mechanics, S. Chand Publisher, 2009. 3. Munson, Bruce R, Donald F Young and T H Okishi, Fundamentals of Fluid Mechanics, 2nd ed, Wiley Eastern 4. Som and Biswas, Introduction to Fluid Mechanics and Machines, TMH 5. Download software from http://www.discoverarmfield.co.uk/data/armsoft/#304

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester:IV
1	Course Code	MEP229
2	Course Title	Fluid Mechanics Laboratory
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	To provide practical knowledge in verification of principles of fluid flow. To impart knowledge in measuring discharge and velocity of fluid flow To understand the major and minor losses Understand the concept of continuity and Bernoulli's equations
6	Course Outcomes	On successful completion of this course, students will be able to CO1: Classify laminar and turbulent flows. CO2: Apply condition of equilibrium for floating body CO3: Measure discharge using venturimeter and orifice meter CO4: Predict the coefficient of discharge for flow through pipes CO5: Estimate the friction and measure the frictional losses in fluid flow CO6: Determine drag coefficient.
7	Course Description	Introduction to fluid mechanics laboratory to understand physical processes more closely. Various apparatus are available in the laboratory like, Verification of Bernoulli's theorem apparatus, venturi & Orifice meters, orifice & mouth piece apparatus, Flow over notches apparatus to understand the concept of conservation of mass momentum and energy , head losses, condition of equilibrium and coefficient of discharge etc
8	Outline syllabus	
	List of Experiments	
	Experiment 1	Determination of fluid viscosity
	Experiment 2	Determination of Reynolds number for a given flow
	Experiment 3	Determination of metacentric height of a flat bottomed vessel
	Experiment 4	Verification of Bernoulli's theorem
	Experiment 5	Flow measurement using venturimeter.
	Experiment 6	Flow measurement using orifice meter
	Experiment 7	Flow measurement using Pitot's tube
	Experiment 8	Determination of head loss in pipe due to sudden contraction, enlargement and elbow bend

	Experiment 9	Determination of co-efficient of friction for different pipes		
	Experiment 10	Determination of drag on a sphere		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1.		
	Software	ANSYS		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: IV
1	Course Code	MEC230
2	Course Title	Strength of Materials
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1. To develop the relationship between the loads applied to a non-rigid body and the internal stresses and deformations induced in the body. 2. To study the general state of stresses and strains in a given loaded member and the magnitude and direction of the principal stresses 3. To understand the different approaches to calculate slope and deflection for various types of beams. 4. To analyze the columns with different edge conditions.
6	Course Outcomes	After the successful completion of course students will be able to: CO1:Apply the concept of stress and strain, elastic constants and constitutive relations to materials. CO2:Determine the stresses and deformations in members subjected to axial, flexural and torsional loads. CO3: Construct the shear force and bending moment diagram of various beams subjected to various loads. CO4:Evaluate slope and deflection in various beams subjected to various loads using different methods. CO5:Determine principal stresses and strains by locating principal planes under combined loading. CO6: Derive the relations for evaluating the stresses in columns subjected to axial loads under various constrained.
7	Course Description	This course is about the performance of deformable solids in various materials under theaction of different kinds of loads. Thus the main objective of the course will be to show how to determine the stress, strain, and

		deflection suffered by structural elements when subjected to different loads. Understanding theadequacy of mechanical and structural elements under different loads is essential for thedesign and safe evaluation of any kind of structure.		
8	Outline syllabus			
	Unit 1	**Loads and Stresses**		
	A	Strain and stress, Hooke's law, Stress-strain diagram, Deformation of resisting forces, Stress at a point,Notations for stress: Double index notation, Stress in thin circular pressure vessel		
	B	Stress produced in compound bars subjected to axial loading		
	C	Thermal stress and strain calculations, Shear stresses and shear strain, Complementary shear stress		
	Unit 2	**Strains and material properties**		
	A	Fundamental strategy of mechanics of deformable mechanics		
	B	Statically indeterminate problems, Lateral strain: Poisson ratio		
	C	Shear strain , Tensile test		
	Unit 3	**Torsion and moments in beams**		
	A	Angle of twist to twisting moment, Stresses and strain in a circular shaft, Hollow shaft ,Statically indeterminate shafts		
	B	Beams: Types of supports, Types of beams and Types of loads and support, Sign convention , Determining shear force and bending moment		
	C	Method of drawing shear force and bending moment diagrams		
	Unit 4	**Stress in beam and deflection**		
	A	Pure bending, Simple bending theory and its application to beams of different sections, Relating curvature of beam to the bending moment		
	B	Beam deflection, Relation between slope, Deflection and radius of curvature,		
	C	Differential equation for deflection of beams, Method of superposition.		
	Unit 5	**Combined stresses and strain & stability**		
	A	Plane stress , Transformation of plane stresses, Mohr circle, Principle plane , Principal stresses and Maximum shear stresses		
	B	Displacement and strain , Strain gauges , Strain rosettes, Criteria for failure		
	C	Introduction to stability of columns, Critical load of an elastic column, Effective length.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Gupta, Vijay., "An Introduction to Mechanics of Materials", Naosa Publishing House		

	Other References	1.Ryder, G.H., “Strength of Materials”, Macmillan(2002),3rd Edition 2.Timoshenko and Young, “Strength of Materials”, East West Press,5th Edition 3.Gupta, V., “Mechanics of materials”, Narosa publishing house, 1st Edition 4.Download MD Solids software(http://www.mdsolids.com/download.htm)

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: IV
1	Course Code	MEP230
2	Course Title	Solid Mechanics lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	1. To familiarize students with various material test. 2.To provide students an understanding of different types of impact test 3. To teach the students about tensile and compression test. 4. To teach students about evaluation of torsional strength. 5. To provide students an understanding of different type of hardness test
6	Course Outcomes	On successful completion of this course students will be able to CO1: Explain the principles of various material testing. CO2: Analyze the various impact test. CO3: Evaluate the torsional strength and modulus of rigidity of material. CO4: Demonstrate tension and compression test CO5:Evaluate hardness of different material by different methodology. CO6: Apply the concept of centre of gravity and centre of mass to solve problems and Compute coefficient static and dynamic friction between given surfaces.
7	Course Description	This course introduces students about various material testing. The students get exposure of common material test like tensile test, compression test, impact test, hardness test.
8	Outline syllabus	
	Experiment 1	To conduct the impact test on impact testing machine and find out the impact strength of mild steel specimen by CHARPY methodand IZOD method
	Experiment 2	To find out the torsion strength and the modulus of rigidity of the material of the test rod.
	Experiment 3	To conduct a compressive test on CTM and determine the ultimate compressive strength of the given specimen

	Experiment 4	To conduct the hardness test on mild steel specimen and find out the hardness of material by Rockwell hardness test method		
	Experiment 5	To conduct the hardness test on aluminium specimen and find out the hardness of material by Brinell hardness test method		
	Experiment 6	To study the UTM and perform tensile test		
	Experiment 7	To perform compression test on UTM.		
	Experiment 8	To find out centre of gravity of different lamina.		
	Experiment 9	To determine the coefficient of friction by inclined plane apparatus		
	Experiment 10	To determine the coefficient of friction by belt-pulley apparatus		
	Mode of examination	Practical		
	Weightage Distribution	CA	ETE	
		60%	40%	

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: IV
1	Course Code	MEC231
2	Course Title	Kinematics of Machines
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1.To familiarize students with links, joints and degrees of freedom to perform position, velocity and acceleration analysis of simple mechanisms using graphical and analytical methods 2.To provide students an understanding of different types of mechanisms 3. To teach the basics of synthesis of simple mechanisms. 4. To teach students the kinematic analysis of cam-follower motion and gear train configurations.
6	Course Outcomes	After the successful completion of course students will be able to: CO1: Apply the principles of degrees of freedom, links, kinematic pairs, chains and their classification in simple planar mechanisms and inversions. CO2: Analyze the positions, velocities and accelerations of planar mechanisms using various graphical and analytical techniques. CO3: Formulate the dimension synthesis of simple mechanisms using function, path and motion approaches. CO4: Construct the various cam profiles for specified motions of followers. CO5: Familiarize the gear profiles and analyze the various gear trains. CO6: Formulate and analyze the linkage and cam-follower mechanisms using graphical techniques.

7	Course Description	This course introduces students to involve in kinematics study how a physical system might develop or alter over time and study the causes of those changes. The fundamental physical laws such as Newton's laws of motion and Kennedy's Instantaneous centres theorem and basic mathematics such as vector algebra, graphical techniques and Chebychev equations are applied in order to synthesis and analyze the simple mechanisms which simulates the motions of various machines.		
8	Outline syllabus			
	Unit 1	**Introduction**		
	A	Mechanisms & Machines, Kinematic pairs, Plane and Space Mechanisms, Kinematic chains and their classification		
	B	Kinematic Diagrams, limit and disguise of revolute pairs		
	C	Kinematic Inversions of four-link planar mechanisms and mobility		
	Unit 2	**Kinematic Analysis of plane mechanisms**		
	A	AronholdKennedy's theorem, Velocity analysis of simple four bar mechanisms using Instantaneous Centres.		
	B	Velocity Analysis of Four bar and crank slider & their inversions only (Graphical)		
	C	Acceleration Analysis of Four bar and crank slider & their inversions only (Graphical)		
	Unit 3	**Dimensional Synthesis of Linkages**		
	A	Types of dimension synthesis, Function Generation (Four bar mechanisms): Fruedenstein's Analytical method using Cheybychev's Spacing		
	B	Function Generation (Four bar mechanisms): Graphical method using three position		
	C	Synthesis of four bar mechanism using motion generation (Graphical method)		
	Unit 4	**Gears and Gear train**		
	A	Spur gear terminology and definitions, Basics of nonstandard gear teeth - Helical – Bevel – Worm - Rack and pinion gears		
	B	Law of toothed and involute gearing, Gear tooth action - Interference and undercutting, Comparison of involute and cycloidal tooth forms		
	C	Kinematic analysis in simple, compound and epicyclic gear trains		
	Unit 5	**Cam-Follower Mechanism**		
	A	Classification of followers and Cams, Radial cam nomenclature		
	B	Description of follower movements, Analysis of follower motion,		
	C	Synthesis of radial cam profile (Graphical Approach)		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%

	Text book/s*	1. Ghosh, A. and Mallik, A.K, Theory of Mechanisms and Machines, 1988.
	Other References	2. Shigley, J.E. and Uicker, J.J., Theory of Machines and Mechanisms, McGraw Hill, 1980. 3. Paul, B., Kinematics and Dynamics of Planar Mechanisms, Prentice Hall, 1979. 4. Bevan, T.E., Theory of Machines, Pearson, 3rd edition, 2010. 5. Rattan, S.S., Theory of Machines, TMH, 4th edition, 2014. Software: – Working Model 2-D. (http://design simulation.com/WM2D/download.php), MATLAB Simulink.

School:SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: IV
1	Course Code	MEC232
2	Course Title	Manufacturing Technology – I
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1. To familiarize casting process and various types of casting. 2. To learn the various metal joining processes. 3. To teach students different types of sheet metal processes. 4. To impart knowledge on selection of suitable manufacturing process for the typical mechanical component.
6	Course Outcomes	After completion of this course the students will be able to CO1 Explain the metal casting process, pattern and of pattern allowanc casting and familiarize the designing of gating system with some advance casting CO2 Study the different types of welding processes in metal joining. CO3 Identify various bulk deformation processes line rolling, forging, Extru CO4 Analyse various sheet metal processes like blanching, punching, emb familiarize about the processing of plastic materials. CO5 Familiarize about the measuring standards and methods in engineering.
7	Course Description	Manufacturing is the creation, through one or several processing operation, of components or products from basic raw materials. The effectiveness of process selection will be based on the inter-related criterion of design parameters, material selection and process economies.
8	Outline syllabus	
	Unit 1	**Metal Casting Processes**
	A	Introduction to foundry, Types of Pattern and pattern allowances, Moulding materials, Core and core materials,
	B	Design of Gating system, Casting defects,
	C	Special casting processes - Shell mould casting, Investment casting, Die casting, Centrifugal casting
	Unit 2	**Metal Joining and Allied Processes**

	A	Fusion welding processes: Introduction, Oxy-fuel Gas welding, Gas cutting, Flame characteristics, Electric Arc welding, Resistance Welding		
	B	consumable electrode and non-consumable electrode, Manual metal arc welding, Gas Tungsten arc welding, Gas metal arc welding, TIG, MIG		
	C	Solid state welding processes:Friction welding,Friction stir welding, Thermit welding, Brazing, soldering, Defects in welding.		
	Unit 3	**Metal Forming Processes**		
	A	Hot and Cold working, Bulk Deformation Processes: Fundamentals of metal forming, Rolling, Forging		
	B	Forging and various Forging operations, Forging defects and remedies. Extrusion principle,		
	C	Hot and Cold extrusions, Wire drawing and Tube drawing		
	Unit 4	**Sheet Metal Processes and Plastic processing**		
	A	Sheet metal characteristics, shearing, bending and drawing operations,Sheet metal processes : Blanking, Punching, Perforating, Notching, Spinning, Embossing, Coining,		
	B	Sheet Metal Working: Deep drawing process, Die and Punch		
	C	Types of Plastics, Types of Molding: Injection molding, Blow molding, Compression molding, Transfer molding		
	Unit 5	**Mechanical Measurement**		
	A	Measurement systems and basic concepts of measurement methods, Definition, significance of measurement, generalized measurement system, Transducers, transfer efficiency		
	B	Classification and selection of measuring instruments and systems. Accuracy, precision and errors in measurement. System of measurement, Classification of standards, calibration, sensitivity, hysteresis, repeatability, linearity, Errors in measurement, classification of errors.		
	C	Transducers and its types, Primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. P.N. Rao, Manufacturing Technology: Foundry, Forming and Welding, Tata McGraw Hill, 2008. 2. Mikell P. Groover, Introduction to Manufacturing Processes, Wiley Publication, September 2011, ©2012		
	Other References	3. A Ghosh and A K Mallik, Manufacturing Science, Wiley Eastern, 2010.		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: IV
1	Course Code	MEP232
2	Course Title	Manufacturing Technology – I Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	This course helps students to gain knowledge and possess a good understanding in diverse areas such as casting, welding and metal forming processes. ● To understand the practical aspects of Foundry & Forging process. ● To understand aspects of welding operations. ● To understand aspects of various sheet metal operations
6	Course Outcomes	After this course the students will be able CO1: To understand basic manufacturing processes like casting and welding CO2: To have a broad knowledge to design a casting process for a product. CO3: To learn various aspects of different welding techniques and welded joints. CO4: To learn about different sheet metal operations CO5 : To learn about forging operation and tools
7	Course Description	The course is designed to provide a basic understanding of traditional methods of materials processing such as casting, forging, molding, forming, and joining used in product manufacturing. Through demonstrationsand laboratory exposure, the student is given the applications of each process.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	Pattern design and making (V-block)
	Experiment 2	To prepare a sand mold, using the given single piece pattern.
	Experiment 3	To prepare a sand mold, using the given split pattern.
	Experiment 4	To make a Butt joint using the given two M.S pieces by arc welding
	Experiment 5	To make a Lap joint using the given two M.S pieces by gas welding

	Experiment 6	To make piping joint by using Arc Welding		
	Experiment 7	Preparation of butt welding using tungsten inert gas (TIG) welding		
	Experiment 8	To make a rectangular Tray as per required dimensions		
	Experiment 9	Preparation of Lathe Machine Tool Post Key by different manufacturing process		
	Experiment 10	To make a chipping hammer by forging operation.		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	2. P.N. Rao, Manufacturing Technology: Foundry, Forming And Welding, Tata McGraw Hill, 2008.		
	Reference	Manuals provided in the lab		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: ME		**Semester: IV**
1	Course Code	HMM305
2	Course Title	Management for Engineers
3	Credits	03
4	Contact Hours (L-T-P)	3-0-0
	Course Type	Compulsory
5	Course Objective	The objective of this course is to expose the students to understand the basics of Management Foundations. The students will be given a detailed grounding for the theories and cases related to the general management. The aim of the course is to orient the students in theories and practices of Management so as to apply the acquired knowledge in actual business practices. This is a gateway to the real world of management and decision-making.
6	Course Outcomes	The student will be able to **CO1**: **Define** basic principles and concepts related to management in an organisation including the functions, different theories of management and roles they play in an organization. **CO2: Explain** the primary function Planning with its process. Also, how forecasting is done in organizations with various techniques are used. **CO3**: **Use** of organizing by studying different types of organization and also using decentralisation and span of control in organizations**.** **CO4**:**Analyse** jobs, recruitment process, manpower planning, job rotation, trainings and rewards invarious organizations. **CO5**: **Measure** motivation and management control concepts to obtain effective controlling in management system in organizations. **CO6**: **Develop** proper system in an organization by using all the functions of management.
7	Course Description	This course gives an overview of engineering management and help to understand the various functions of management used in an organization. The focus of the course is the development of individual skills and team work.
8	Outline syllabus	
	Unit 1	**Introduction of Management & Organisation**
	A	Management-Definition of Management & Organisation
	B	Concept, Nature, Scope and Functions of Management, Levels of Management, Management Theories - Taylors principle, Fayol's Principles, Hawthorne Studies, Systems Approach and Contingency Approach to Management.

	C	Mintzberg's Managerial Roles, Skills of Manager		
	D	Functions of management		
	Unit 2	**Management Planning Process**		
	A	Planning objectives and characteristics.		
	B	Hierarchies of planning.		
	C	The concept and techniques of forecasting.		
	Unit 3	**Organizing**		
	A	3.1 Meaning, Importance and Principles,		
	B	3.2 Departmentalization, Span of Control,		
	C	3.3 Types of Organization,		
		Authority, Delegation of Authority.		
	Unit 4	**Staffing**		
	A	4.1 Meaning, Job analysis		
	B	4.2 Manpower planning, Recruitment, Transfers and Promotions		
	C	4.3 Appraisals, Management Development, Job Rotation, Training, Rewards and Recognition,		
	Unit 5	**Directing & Controlling**		
	A	Motivation, Co-ordination, Communication,		
	B	Directing and Management Control, Decision Making,		
	C	Management by objectives (MBO) the concept and relevance. Objectives and Process of Management Control		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Principles & practice of Mgmt., L.M. Prasad		
	Other References	• Management Today, Burton & Thakur • Principles & Practices of Mgmt., C.B. Gupta • Understanding Management, Richard L. Daft • Management, Stoner, Freemand & Gilbert • Essential of Management, Koontz O' Donnel		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: CSE		**Semester: Vth | QAB**
1	Course Code	**ARP 301**
2	Course Title	**Quantitative Aptitude Behavioural and Interpersonal Skills**
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Status	
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 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 CO3: Behavioural and Interpersonal Skills CO4: Avoiding Arguments | The Art of Assertiveness CO5: Constructive Criticism 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**
	A	What is Personality?|Creating a positive impression – The 3 V's of Impression |Individual Differences and Personalities
	B	Personality Development and Transformation | Building Self Confidence | Behavioural and Interpersonal Skills
	C	Avoiding Arguments | The Art of Assertiveness | Constructive Criticism | The Personal Effectiveness Grid | Assessing our Strengths & Limitations

		and Creating an Action Plan for Learning with the 4M Model | Verbal Abilities-3
	Unit 2	**Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical**
	A	Numbers & Digits , Mathematical Operations | Analytical Reasoning
	B	Cubes & Cuboids | Statement & Assumptions
	C	Strong & Weak Argument
	Unit 3	**Quantitative Aptitude**
	A	Work & Time ,Pipes & Cistern
	B	Time ,Speed & Distance, Quadratic & Linear Equations, Logs & Inequalities
	C	Sequence & Series,Logarithms, Data Interpretation | Data sufficiency - Level 1
	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

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: CSE		**Semester: VIth |HOM**
1	Course Code	**ARP 302**
2	Course Title	**Higher Order Mathematics and Advanced People Skills**
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Status	
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 4thphase 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: The art of Negotiations CO5: Understanding Personal Branding CO6: Relationship Management | Verbal Abilities-4 CO7: 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**
	A	HR Sensitization (Role Clarity | KRA | KPI | Understanding JD) | Conflict Management
	B	Negotiation Skills | Personal Branding
	C	Empathy VS Sympathy | Relationship Management | Verbal Abilities-4
	Unit 2	**Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical**
	A	Sitting Arrangement & Venn Diagrams | Puzzles | Distribution |

		Selection
	B	Direction Sense | Statement & Conclusion | Strong & Weak Arguments
	C	Analogies,Odd One out | Cause & Effect
	Unit 3	Quantitative Aptitude
	A	Average , Ratio & Proportions,Mixtures & Allegation
	B	Geometry-Lines,Angles& Triangles
	C	Problem of Ages | Data Sufficiency - L2
	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

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: V**
1	Course Code	MEC340
2	Course Title	Dynamics of Machines
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1. To understand the concepts of turning moment diagrams, flywheel design and the dynamics of reciprocating engines. 2. To understand the balancing procedures for rotating and reciprocating masses, rotors and engines. 3. To understand the fundamentals of free and forced vibrations of single degrees of freedom. 4. To provide students an understanding of different types of governors and effect of gyroscopic couples in various vehicles.
6	Course Outcomes	After the successful completion of course students will be able to: CO1: Analyze the dynamic forces in machines. CO2: Demonstrate an understanding of turning moment diagrams in various applications and selection of flywheel and centrifugal governors used in machines. CO3: Apply theory involved in balancing of rotating and reciprocating machines. CO4: Measure and infer the effects of gyroscopic couple in ships, aero planes and automobiles. CO5: Evaluate the free and forced vibrations of damped single degree freedom systems. CO6: Select the appropriate analytical and graphical techniques for analysing the dynamics of machines.

7	Course Description	This course introduces students to involve with the forces and their effects, while acting upon the machine parts in motion. The fundamental physical laws such as D'Alembert's etc. are applied to Analyze the motions of mechanisms, design mechanisms to have given motions and analyze forces in machines viz. flywheel, gyroscopes, locomotives. The course describes the requirement of balancing of rotor in a single and two planes under static and dynamic conditions. The application of vibrations and its analysis with respect to free, damped and harmonic excitations with involvement of Rayleigh's and energy methods are discussed.
8	Outline syllabus	
	Unit 1	**Dynamic Force Analysis and Turning Moment Diagram**
	A	D'Alembert's principle, Dynamic force analysis of slider crank mechanism excluding inertia of connecting rod. Piston and crank effort. Turning moment on crankshaft
	B	Engine force analysis including inertia of connecting rod.Equivalent offset inertia force
	C	Turning moment on crankshaft, turning moment diagrams-single cylinder double acting steam engine, four stroke IC engine and multi-cylinder steam engine, fluctuation of energy, flywheel.
	Unit 2	**Static and Dynamic Balancing**
	A	Static and dynamic balancing, balancing of several masses in the same plane and different planes
	B	Partial balancing of two cylinder locomotives, variation of tractive force, swaying couple, hammer blow
	C	Balancing of multi-cylinder inline engines (only 4 and 6 cylinders)
	Unit 3	**Governors and Gyroscopic Motion**
	A	Terminology, centrifugal governors-Watt governor, Dead weight governors-Porter & Proell governor, Sensitivity, Stability, Hunting, Isochronism.
	B	Principles of gyroscopic torque. Effect of gyroscopic couple on the stability of aeroplanes and ships
	C	Effect of gyroscopic couple on the stability of automobiles.
	Unit 4	**Longitudinal Vibration**
	A	Types of vibrations, Degrees of freedom, Free vibrations of undamped single degree of freedom system
	B	Types of damping. Free vibrations of damped single degree of freedom system, Logarithmic decrement.
	C	Forced vibration – harmonic excitation – Magnification factor – Vibration isolation
	Unit 5	**Transverse and Torsional Vibrations**
	A	Transverse vibrations of shafts and beams – Rayleigh's and Dunkerley's

		method.		
	B	Whirling of shafts. Critical speeds of shaft		
	C	Torsional vibrations – Single rotor and two rotors		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Rattan S.S. Theory of Machines, Tata-McGraw Hills Publications, 3rd edition.		
	Other References	1. Shigley, J.E. and Uicker, J.J., Theory of Machines and Mechanisms, McGraw Hill, 1980. 2. Paul, B., Kinematics and Dynamics of Planar Mechanisms, Prentice Hall, 1979. Software- Download working model 2-D Software, MATLAB Simulink.		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: ALL		Semester: V
1	Course Code	MEP340
2	Course Title	Dynamics of Machinery Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	The course covers the procedures needed to develop the concepts related to precision measurement, inspection and analysis of dynamic behaviour of system
6	Course Outcomes	After successful completion of this course the student will be able to CO1: Analyze and design centrifugal governors CO2: Understand the gyroscopic effects in ships, aero-planes and road vehicles. CO3: Analyze balancing problems in rotating and reciprocating machinery. CO4: Understand free and forced vibrations of single degree freedom systems.
7	Course Description	The course covers the procedures needed to develop the concepts related to precision measurement, inspection and analysis of dynamic behaviour of system
8	Outline syllabus	
	List of Experiments	
	Experiment 1	To perform experiment on watt governor to prepare performance characteristics curve
	Experiment 2	To perform experiment on Porter governor to prepare performance characteristics curve
	Experiment 3	To perform experiment on Proell governor to prepare performance characteristics curve
	Experiment 4	Observation of gyroscopic behavior. And experimental justification of the equation C= I.ω.ωp for calculating the gyroscopic couple by observation and measurements of result for independent variation in applied couple C and precession ωp
	Experiment 5	To obtain balancing mass for the rotating mass system.
	Experiment 6	To study whirling phenomenon in shaft and observe various modes of Vibrations.
	Experiment 7	To determine the radius of gyration of compound pendulum and compare with theoretical value.

	Experiment 8	To study the free vibration and to determine the natural frequency of vibration of two-rotor system.		
	Experiment 9	To verify the relation $T=2\pi\sqrt{L/g}$ Where T- Periodic time in sec. and L- Length of pendulum in cm.		
	Experiment 10	To study the longitudinal vibrations of helical spring and to determine the frequency or period of vibration (oscillation) theoretically and actually by experiment.		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	Handouts given by the instructor		
	Software	-		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: V**
1	Course Code	MEC331
2	Course Title	Machine Design
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1: Develop an ability to apply knowledge of mathematics, science, and engineering 2: To develop an ability to design a system, component, or process to meet desired needs within realistic constraints. 3: To develop an ability to identify, formulate, and solve engineering problems. 4: To develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
6	Course Outcomes	After the successful completion of course students will be able to: CO1: Understand the customers' need, formulate the problem and draw the design specifications. CO2: Understand component behaviour subjected to loads and identify the failure criteria. CO3: Analyze the stresses and strains induced in a machine element. CO4: Understand the concepts of principal stresses, theories of failure, stress concentration and fatigue loading. CO5: Design a machine component using theories of failure. . CO6: Analyze the pressure distribution and design journal bearings.
7	Course Description	Machine design studies the conversion of one type of motion to another. Along with the change in the type and direction of motion, the rotational speed and torque may also change. This course begins with a review and further development of stress analysis (statics). At that point, specific components of machines, such as shafts and bearings and belts, chains and gears will be addressed.
8	Outline syllabus	
	Unit 1	**Introduction and Design against Static Load**
	A	Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes
	B	Modes of failure, Factor of safety, Principal stresses
	C	Stresses due to bending and torsion, Theory of failure

	Unit 2	**Design against Fluctuating Loads**		
	A	Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts,		
	B	Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria		
	C	Shafts subjected to fatigue loads, Design for rigidity		
	Unit 3	**Shafts, Keys and couplings**		
	A	Cause of failure in shafts, Materials for shaft, Stresses in shafts		
	B	Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments		
	C	Types of keys, splines, Selection of square & flat keys, Strength of sunk key		
	Unit 4	**Fasteners and Springs**		
	A	Threaded joints, Basic types of screw fastening, Design of bolted joint		
	B	Riveted joints, Types of failure, Caulking & fullering, Design of riveted joints		
	C	Types of springs, Terminology of helical springs, styles of end, spring materials, Design of helical springs against static and loads		
	Unit 5	**Rolling Contact Bearing and Sliding Contact Bearing**		
	A	Bearings, Types of Rolling contact bearings, Selection of bearing types, Static load carrying capacity, Stribeck's equation		
	B	Dynamic load carrying capacity, Equivalent bearing load, Load life relationship		
	C	Basic modes of lubrication, Hydrostatic step bearing, Bearing design,comparison of rolling and sliding contact bearings		
	Mode of examination	**Theory**		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1)Bhandari, V.B.,"Design of Machinery" Tata McGraw Hill Publications, 2010		
	Other References	1) Shigley, J.O., "Mechanical Engineering Design" , McGraw Hill Publishers, 2004 2) Norton, R.L., "Machine Design an Integrated Approach", Prentice Hall publishers, 2006 3) Download MIT Calc for Shaft, Bearing and Spring design from http://www.mitcalc.com/en/download.htm		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: V**
1	Course Code	MEC332
2	Course Title	Heat Transfer
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	To introduce the physical phenomena involved and knowledge of heat transfer calculations. To formulate and solve typical problems based on different modes of heat transfer .To design some heat exchange equipment used in practice. To learn the design and conduct of heat transfer instruments including communication of results.
6	Course Outcomes	On successful completion of this course students will be able to CO1 Develop a basic concept heat transfer and conduction process in steady as well as transient state CO2 Design fins CO3 Distinguish natural and forced convection process and estimate energy transfer and temperature in various situation CO4 Explain Radiation process and energy exchange between different surfaces CO5 Measure technical requirement of Heat exchanger, its effectiveness and analysis of energy during exchange of energy CO6 Apply appropriate mathematical methods and principles of heat transfer to model and analyse engineering situations
7	Course Description	The course will introduce the fundamental concepts of various modes of heat transfer. It willfurther elaborate these concepts with theories and applications to the solutions of practicallyrelevant chemical engineering problems. Some aspects of process design principles of variousheat transfer equipment will be taken up in the later part of this course. Finally, to present aphysical picture of the convection process, heat transfer in boundary layer flows will beaddressed. Even though the course is primarily designed to meet the requirements of anundergraduate chemical engineering course on heat transfer, it will be useful for the practicingengineers to refresh with fundamental and technical information
8	Outline syllabus	
	Unit 1	**Basic Concepts of Heat Transfer**
	A	Introduction: Units, Heat transfer in Engineering, Basic mode of Heat

		Transfer, Thermal conductivity for various types of materials,		
	B	Fundamental equation of heat conduction in Cartesian, Cylindrical and Spherical coordinates, One dimensional steady state heat conduction ,		
	C	Transient heat conduction		
	Unit 2	**Fin Design**		
	A	The purpose of fin and its applications, Steady state heat conduction through fins of uniform cross section,		
	B	Fin effectiveness and fin efficiency		
	C	Error –estimation in temperature measurement.		
	Unit 3	**Convection:**		
	A	Fundamentals of Convective heat transfer, Boundary layer theory and Non-dimensional numbers ,		
	B	Forced convection in variety of configurations, correlations,		
	C	Natural convection in single-phase fluids, Heat transfer in boiling and condensation, correlations.		
	Unit 4	**Radiation**		
	A	Nature of thermal Radiation, Basic Relations,		
	B	Radiant heat exchange between black and gray surfaces,		
	C	Electrical network analogy for thermal Radiation system, Radiation Shields,		
	Unit 5	**Heat Exchangers**		
	A	Function and configuration of heat exchangers,		
	B	LMTD method of heat exchanger analysis.		
	C	Heat Exchanger effectiveness, NTU method.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Sachdeva R.C., Fundamentals of Engineering Heat and Mass Transfer , 4th Edition, New Age International,2010		
	Other References	2. Gupta Vijay, Heat and Mass Transfer, Tata McGaw-Hill, 2004 3. Incropera F.P. and Dewitt D.P, Fundamentals of Heat and Mass Transfer, 4th edition, John Wiley & Sons 4. Holman J.P. , Heat Transfer, 8th edition, McGraw Hill		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: V
1	Course Code	MEP332
2	Course Title	Heat Transfer Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	The laboratory course is aimed to provide the practical exposure to the students with regard to the determination of amount of heat exchange in various modes of heat transfer.
6	Course Outcomes	On successful completion of this course, students will be able to CO1: Understand application of different mode of heat transfer. CO2: Experimental analysis to measure the thermal conductivity CO3: Apply heat transfer by conduction in solids for steady state and transient conditions CO4: Estimate average heat transfer coefficient for free and forced convection. CO5: Measure Stefan Boltzmann constant and surface emissivity of a test plate. CO6 Analysis of heat exchanger performance parameter for parallel and counter flow heat exchanger
7	Course Description	Heat Transfer laboratory provides fundamental and industrial knowledge about modes of heat transfer, like conduction, convection and radiation, and their application
8	Outline syllabus	
	Experiment 1	To determine the thermal conductivity of an insulating powders.
	Experiment 2	To draw the temperature distribution profile of a pin fin for natural and forced convection process.
	Experiment 3	To determine the thermal conductivity of a Glycerin.
	Experiment 4	Theoretical and experimental analysis of insulated heat pipe.
	Experiment 5	To determine the LMTD, Overall heat transfer coefficient and effectiveness of parallel and counter flow of heat exchanger.
	Experiment 6	To determine the temperature at each face of composite wall and draw its temperature drop profile.
	Experiment 7	To determine the Stefan-Boltzmann's constant using Stefan-Boltzmann's Apparatus
	Experiment 8	To determine the heat transfer coefficient for natural convection process using electrically heated tube

	Experiment 9	To determine the emissivity of a copper plate		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	3.		
	Software	ICEM CFD		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MEC336
2	Course Title	IC Engines
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	The objective of this course is to make the students familiar with the various internal combustion engines, thermodynamic analysis of S.I and C.I engines, requirements and understanding of combustion related principles, lubrication systems, ignition processes, measurement of important parameters for the performance evaluation.
6	Course Outcomes	After the successful completion of course students will be able to: CO1: Demonstrate the ability to perform a thermodynamic analysis of Otto, Diesel, and Dual cycle models. CO2: Demonstrate the characteristics of common liquid and gaseous fuels with the ability to perform a combustion analysis of these fuels in the basic cycles. CO3: Explain the characteristic of homogeneous combustion in SI-engines and spray combustion in CI-engines. Fuel quality requirements of SI and CI-engines. CO 4: Explain methods for reduction of exhaust emissions, and their relations to fuel quality. CO5:Analyze different ignition system, fuel injection systems, lubrication systems, supercharging and its effect. CO6: Measure and calculate the engine performance parameters and its operating characteristics.
7	Course Description	This course studies the fundamentals of how the design and operation of internal combustion engines affect their performance, operation, fuel requirements, and environmental impact. Topics include thermodynamics, combustion, friction phenomena and fuel properties with reference to engine power, efficiency, and emissions. Students examine the design features and operating characteristics of different types of internal combustion engines: spark-ignition, diesel, and stratified-charge.
8	Outline syllabus	
	Unit A	**Introduction to I.C Engines**
	A	Engine classification, Air standard cycles, Otto, Diesel, Stirling, Ericsson

		cycles, Actual cycle analysis.		
	B	Two and four stroke engines, SI and CI engines.		
	C	Valve timing diagram, Scavenging in 2 Stroke engines, Rotary engines, stratified charge engine.		
	Unit 2	**Fuels**		
	A	Fuels for SI and CI engine, important qualities SI engine fuels, Rating of SI engine fuels, Important qualities of CI engine fuels.		
	B	Dopes, Additives, Gaseous fuels, LPG, CNG, Biofuels, Alternative fuels for IC engines.		
	C	Thermo-chemical reactions.		
	Unit 3	**SI Engines**		
	A	Principle of carburetion, Mixture requirements, Combustion in SI engine, Flame speed, Ignition delay		
	B	Abnormal combustion and it's control, combustion chamber design for SI engines		
	C	Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, MPFI.		
	Unit 4	**CI Engine**		
	A	Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings		
	B	Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI Engines		
	C	Exhaust emission and it's control of I.C Engine.		
	Unit 5	**Engine Cooling and recent development**		
	A	Lubrication**:** Engine friction, Lubrication principal, Type of lubrication, Lubrication oils, Crankcase ventilation		
	B	Supercharging and Turbocharging**:** Effect of altitude on power output, Types of supercharging		
	C	Testing and Performance: Performance parameters, Basic measurements, Testing of SI and CI engines		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Ganesan V., I.C Engines, Tata Mc Graw Hill Publishers		

	Other References	1.Haywood B., Internal Combustion Engine Fundamentals, McGraw-Hill Science/Engineering Engineering, 2010 2.Willard W. Pulkrabek, Fundamentals of the Internal Combustion Engine, PHI Publication, 2010 3.Richard Stone, Introduction to Internal Combustion Engine, Society of Automotive Engineers Inc., 2011 4.Gill, Smith,Ziurs, Fundamentals of Internal Combustion Engine, Oxford & IBH Publishing, 2010 5.Rogowsky ,COIC Engines, International Book Co., 2010 6.Engine CR software, download from http://www.sharewareconnection.com/enginecr.htm

chool: SET		Batch :2019-2023
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MEP324
2	Course Title	I C Engine Laboratory
3	Credits	2
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	The objective of this course is to make the students familiar with the internal combustion engines, thermodynamic analysis of S.I and C.I engines, recent developments and performance evaluation of I.C engines.
6	Course Outcomes	CO1: Analyse different classes of IC Engines with the respective thermodynamic process and understand the important developments in IC engines. CO2: Explain the fuel quality requirements and alternate fuels for SI and CI engines CO 3: Explain the combustion, lubrication and fuel injection processes in SI engines CO4:Explain the combustion, lubrication and fuel injection processes in CI engines CO5: Measure and calculate the engine performance parameters and its operating characteristics.
7	Course Description	After completing this course, students will have a practical understanding of Internal Combustion Engines, including overview of IC Engines and its different types of combustion process in SI Engine, CI Engine. This will enable the students to diagnose the normal and abnormal combustion with performance evaluation of IC Engine heat balance sheet.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	To study the two stroke single cylinder petrol engine
	Experiment 2	To study the four stroke single cylinder petrol engine
	Experiment 3	To study the four stroke four cylinder diesel engine
	Experiment 4	To perform Experiment on the four cylinder four stroke petrol engine test rig.(Morse Test)
	Experiment 5	To perform efficiency experiments on the single cylinder two stroke Petrol engine test rig

	Experiment 6	To perform experiment on the single cylinder four stroke Diesel engine test rig.		
	Experiment 7	To study the ignition system of two stroke engine		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1.		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MEP397
2	Course Title	CNC Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	The course provides an in-depth understanding and skill of writing programs by M codes for turning and Milling components. The students will have hands-on e generate automated tool paths for an engineering component.
6	Course Outcomes	Students will able to CO1- Analyse the CNC codes using Virtual CNC software. CO2 - Apply the CNC programming for different kind of operation on a job operation in CNC lathe. CO3 - Develop the CNC programming for drilling, grooving and boring on a job operation in CNC lathe. CO4 – Apply the CNC programming using various kind of interpolation on a job operation in CNC Milling machine. CO 5 –Analyse the CNC Programming on a job using mirror imaging in CNC Milling Machine. CO6- Analyse the CNC Programming on a job using Profiling in CNC Milling Machine.
7	Course Description	The objective of this laboratory enables the students will learn to use the CNC machines efficiently for manufacturing desired products and knowledge of programming and use of CNC tooling. The students will use programmable language called G code to input desired project dimensions and work conditions, such as feed rate and speed. This information is relayed to the CNC machine's integrated computer system as work instructions that control the machining process. These machines can be used for specialized and complex applications, including engraving and die sinking, or making impressions in die blocks.

8	Outline syllabus			
	Experiment 1	Generate and verify the CNC codes using Virtual CNC software.		
	Experiment 2	Develop the CNC program for facing operation on a job of given dimension using CNC Lathe.		
	Experiment 3	Develop the CNC program for Plain and Step turningoperation on a job of given dimension using CNC Lathe.		
	Experiment 4	Develop the CNC program for taper turning operation on a job of given dimension using CNC Lathe.		
	Experiment 5	Develop the CNC program for internal and external threading operation on a job of given dimension using CNC Lathe.		
	Experiment 6	Develop the CNC program for grooving, drilling and boring on a job of given dimension using CNC Lathe.		
	Experiment 7	Develop the CNC program using linear interpolationfor a job of given dimension using CNC Milling machine.		
	Experiment 8	Develop the CNC program using circular interpolation for a job of given dimension using CNC Milling machine.		
	Experiment 9	Develop the CNC program using mirror imaging on a job of given dimension using CNC Milling machine.		
	Experiment 10	Develop the CNC program using profiling for a job of given dimension using CNC Milling machine.		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	NITW CNC Lab Manual		
	Reference	Handouts given by the instructor		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MEC335
2	Course Title	Turbo machinery
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1) To teach design principles of turbines and pumps and to use them in engineering 2) To introduce the theory of hydraulic machines and it's applications. 3) The student will be aware of the importance, function and performance of hydro machinery. 4) The student will know the hydrodynamic forces acting on vanes and their performance evaluation. 5) The student will be in a position to evaluate the performance characteristics of hydraulic turbines
6	Course Outcomes	At the end of the course, the student will be able to: CO1:Analyze the forces exerted by a jet of fluid on vanes of different shapes, either stationary or moving CO2: Study and analyze the construction features and working principles of different classes of hydraulic turbines. CO3: Analyze the performance characteristic curves of hydraulic turbines. CO4: Distinguish between different classes of pumps, their construction features and further analyze their performance. CO5: Understand the working principles of various hydraulic systems, hydraulic control systems and fluids. CO6: Apply the knowledge of hydraulic machines in power plant engineering
7	Course Description	This course describes about the principles and application of turbo machinery.
8	Outline syllabus	
	Unit 1	**Principles of hydraulic Machinery**
	A	Newton's Second law of motion, linear momentum Equation and angular momentum equations. Impact of jet on fixed and moving plates.
	B	Angular momentum equation and its applications. Fundamental

		equation of fluid Machines (Euler's Equation).		
	C	Hydro Electric Power plant: Classifications, layout and its components		
	Unit 2	**Hydraulic Turbines (Impulse)**		
	A	Construction and working Principle of Pelton Wheel,		
	B	Unit quantities and Specific speed		
	C	Design , Characteristics and governing of Pelton Wheel		
	Unit 3	**Hydraulic Turbines (Reaction)**		
	A	Reaction turbines: Francis and Propeller (Kaplan) turbines,		
	B	Design and Characteristics and governing of Reaction turbines		
	C	Draft tube, Cavitation and selection criterion		
	Unit 4	**Pumps**		
	A	Reciprocating pumps: classification, working principle, single stage and multi stage pumps, Air-vessel, Selection criterion		
	B	Centrifugal Pumps: Velocity triangles, Single and multistage pumps, Cavitation in pumps		
	C	Testing and Performance characteristics of reciprocating and Centrifugal pumps		
	Unit 5	**Miscellaneous Hydraulic Machines**		
	A	Jet pump, , Air lift pump, Hydraulic Ram, Screw Pump		
	B	Hydraulic press, Hydraulic crane, Hydraulic Lift, Pressure Intensifier		
	C	Fluid Coupling & Torque Converter		
	Mode of examination			
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Rajput R.K., Hydraulic Machines, 4th Edition, S. Chand, 2010.		
	Other References	1. Lal Jagdish, Hydraulic Machines, Metropolitan 2. Modi and Seth, Hydraulic Machines, standard Book House		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MEP335
2	Course Title	Turbo machinery Laboratory Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	To understand the concept and basic concepts of turbomachinery, working of diff (such as pelton wheel, Kaplan and Francis turbine) and different pumps (reciproc centrifugal pump) through a series of experiments.
6	Course Outcomes	Students will able to CO1- Analyze the forces exerted by a jet of fluid on vanes. CO2 - Study and analyze the construction features and working principles of different classes of hydraulic turbines. CO3 - Analyze the performance characteristic curves of hydraulic turbines. CO4 - Study and analyze the construction features and working principles of different pumps. CO 5 - Analyze the performance characteristic curves of hydraulic pumps. CO6- Understand the working principles of various hydraulic systems such as hydraulic lift and hydraulic ram.
7	Course Description	The objective of this laboratory is to introduce to students the principles of working, constructional details, design features and performance characteristics of various machines like turbines, pumps and other devices using incompressible fluids (liquids) and the ability to visualize and design some simple equipment used in practice.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	To estimate the Impact of jet of a fixed vane.
	Experiment 2	To determine the characteristics of a Pelton turbine.

	Experiment 3	To determine the characteristics of a Francis turbine.		
	Experiment 4	To determine the characteristics of a Kaplan turbine.		
	Experiment 5	To determine the characteristics of a reciprocating pump		
	Experiment 6	To determine the characteristics of a centrifugal pump		
	Experiment 7	Experimental and analytical study of a Hydraulic ram.		
	Experiment 8	Experimental and analytical study of a Hydraulic lift		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	Rajput R.K., Hydraulic Machines, 4th Edition, S. Chand, 2010.		
	Reference	Manuals provided in the lab		

School: SET		**Batch :2019-2023**			
Program: B.Tech		**Current Academic Year: 2019-2020**			
Branch: Mechanical Engineering		**Semester:VII**			
1	Course Code	**MME463**			
2	Course Title	**Major Project I**			
3	Credits	3			
4	Contact Hours (L-T-P)	0-0-6			
	Course Status	Compulsory			
5	Course Objective	The course provides an in-depth understanding and skill in the field of Mechanical Engineering and its associated fields.			
6	Course Outcomes	After successful completion of the course, the students will be able to: CO1:Identify a topic in advanced areas of mechanical engineering CO2: Review literature to identify research gaps and define objectives CO3: Evaluate the feasibility of project. CO4: Generate and implement innovative ideas for social benefit. CO5: Develop a prototype/models, experimental set up and software systems necessary to meet the objectives			
7	Course Description	The course provides an in-depth understanding and skill in the field of Mechanical Engineering and its associated fields.			
	Mode of examination	Project report and Viva-Voce			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	As per the field/specialization			
	http:/	Google scholar, Research gate.			

School: SET		**Batch :2019-2023**			
Program: B.Tech		**Current Academic Year: 2019-2020**			
Branch: Mechanical Engineering		**Semester:VIII**			
1	Course Code	**MME464**			
2	Course Title	**Major Project II**			
3	Credits	8			
4	Contact Hours (L-T-P)	0-0-16			
	Course Status	Compulsory			
5	Course Objective	The course provides an in-depth understanding and skill in the field of Mechanical Engineering and its associated fields.			
6	Course Outcomes	After successful completion of the course, the students will be able to: CO1:Identify the methodologyto carry the experiments towards significant outcome. CO2: Reorganize the procedures with a concern for society, environment and ethics CO3: Analyze and discuss the results to draw valid conclusions CO4: Prepare a report as per the recommended format and defend the work. CO5: Explore the possibility of publishing papers in symposium/conference proceedings.			
7	Course Description	The course provides an in-depth understanding and skill in the field of Mechanical Engineering and its associated fields.			
	Mode of examination	Project report and Viva-Voce			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	As per the field/specialization			
	http:/	Google scholar, Research gate.			

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: V**
1	Course Code	MEC221
2	Course Title	Manufacturing Technology-II
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. The objective of this course is to understand the basic mechanism of metal removal and selection of appropriate tool material for machining. 2. To understand the process parameters and their effects on the performance of various machining operations.
6	Course Outcomes	On successful completion of this course students will be able to CO1: Apply the basic principles in metal cutting according to the need along with selection of the appropriate tool nomenclature for performing different machining operations. CO2: Characterise the materials through chip morphology CO3: Analyse the different forces during various cutting conditions. CO4: Identify and select the appropriate material for different types of machining and recognize different types of tool wear and the reasons behind that. CO5: Measure and calculate the expected tool life in different circumstances, machinability, and economics of machining CO6: Differentiate between various machine tools and machining operations that can be performed on them.
7	Course Description	This course introduces students to the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching. To make students understand the basic concepts of traditional machining processes, tool life, wear and tear and economics of machining.
8	Outline syllabus	
	Unit 1	**Deformation and Cutting of Metals**
	A	Elastic and Plastic deformation.
	B	Tool Nomenclature: Single Point cutting tool- Signification of the various angle of cutting tool and nose radius, tool nomenclature: Tool on hand,

		ASA & ORS.		
	C	Nomenclature of drills, Milling cutters and broaches.		
	Unit 2	**Mechanics of Metal Cutting**		
	A	Need for chip breaker, Mechanism of Formation of chips-types of chips and the condition conducive for the formation of each type-built-up edge, its effects		
	B	Orthogonal Vs oblique cutting, Merchant's circle diagram-Force and velocity relationship, shear plane angle,		
	C	Energy consideration in machining-Ernst Merchants theory of shear angle relationship.		
	Unit 3	**Cutting Forces in Machining**		
	A	Forces in turning, drilling, milling.		
	B	Forces in Grinding, Conventional Vs climb milling, Specific cutting force		
	C	Introduction of tools dynamometer- construction and principle of operation of tools dynamometer for turning, drilling and milling based on tool deflection, tool deformation and pressure.		
	Unit 4	**Tool Materials , Tools Wear and Tool life**		
	A	Requirement of tool materials- advances in tool materials-HSS,PM, HSS, coated HSS, carbides and coated carbides, ceramic, cold pressed, hot pressed, ceramic composites,		
	B	CBN, Diamond properties, advantages and limitation- ISO specification for inserts and tools holders, Different kinds of Tool Wear and prevention techniques.		
	C	Tool life, Machinability, economics of machining.		
	Unit 5	**Machine Tools and operations**		
	A	Machining operation perform by - Lathe, Milling, shaping, slotting, planning, Drilling, Boring, Broaching, Grinding (cylindrical, surface, center less),		
	B	Thread rolling and gear cutting machining.Machining on capstans and Turret lathe.		
	C	Micro finishing operations like honing lapping, super finishing		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	A Ghosh and A K Mallik, Manufacturing Science, Wiley Eastern, 2010.		
	Other References	1) H.M.T, "Production Technology" 1st Edition, Tata Mc GrawHill Publishing Co.Ltd, 2008. 2) Introduction to machining Science by G.K Lal , New Age International (P) Limited		

		3) Mikell P. Groover, Introduction to Manufacturing Processes, Wiley Publication, September 2011, ©2012

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: ME		**Semester: V**
1	Course Code	MEC328
2	Course Title	Computer Integrated Manufacturing Systems
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. The students will acquire a knowledge of different elements of automated processes in a modern manufacturing environment integrated with computer control. 2. The students will have an understanding of using engineering design, and modelling techniques towards computer controlmanufacturing. 3. The students will get knowledge about the integration robot and numerical control in production lines.
6	Course Outcomes	After completion of the this course the students will be able to CO1: Identify the main elements in computer integrated manufacturing systems. CO2: Analyse the assembly line balancing and calculate the cycle time of automated material handling systems. CO3: Apply CAM tools and CNC in manufacturing processes. CO4: Interpret the concept of CAD and graphical modelling in product designing. CO5: Familiarize and analyse the use of robotics in modern manufacturing. CO6 : Construct geometric modelling using Solid works software
7	Course Description	This course is designed to give you a thorough understanding of the technology used in manufacturing systems. You will also be introduced to the concepts of computer integrated manufacturing and relevant standards, feature technology, product life cycle management, computer aided manufacturing, and computer numerical control.
8	Outline syllabus	
	Unit 1	**Introduction and Automated Flow Lines**
	A	Introduction, Product Development through CIM, Product development cycle, Types of production, Functions.
	B	Transfer mechanism, Buffer storage, Analysis of transfer lines, Line unbalancing concept, Automated assembly systems
	C	Line unbalancing concept, Automated assembly systems

	Unit 2	**Automated Handling, Storage and Inspection**		
	A	Automated material handling systems		
	B	AS/RS - carousel storage		
	C	Automated inspection, Contact and non- contact methods.		
	Unit 3	**Numerical Control**		
	A	NC-CNC Programming		
	B	Part programming		
	C	DNC - Adaptive control		
	Unit 4	**CAD**		
	A	Principle of Computer Graphics, Geometric modelling		
	B	Plotting a Drawing: 2D and 3D,		
	C	Design of Curved Shapes, Splines ,Curves and Nurbs		
	Unit 5	**Robotics**		
	A	Robot anatomy - Specifications, Programming		
	B	End effectors, Sensors.		
	C	Robot cell design - CAD/CAM.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Mikell P.Groover, "Automation, Production Systems and Computer Integrated Manufacturing," PHI, 1995.		
	Other References	2. Weatherall, "Computer Intergrated Manufacturing: A Total Company Strategy," 2nd edition, 1995. 3. Ronald G. Askin, "Modeling and analysis of Manufacturing Systems," John Wiley & Sons, 1993. Software: – AutoCAD and Solidworks		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MEC336
2	Course Title	I C Engines
3	Credits	4
4	Contact Hours (L-T-P)	3-0-2
	Course Status	Compulsory
5	Course Objective	The objective of this course is to make the students familiar with the various internal combustion engines, thermodynamic analysis of S.I and C.I engines, requirements and understanding of combustion related principles, lubrication systems, ignition processes, measurement of important parameters for the performance evaluation.
6	Course Outcomes	At the end of the course, the student will be able to: CO1: Analyse different classes of IC Engines with the respective thermodynamic process and understand the important developments in IC engines. CO2: Explain the fuel quality requirements and alternate fuels for SI and CI engines CO 3: Explain the combustion, lubrication and fuel injection processes in SI engines CO4:Explain the combustion, lubrication and fuel injection processes in CI engines CO5: Measure and calculate the engine performance parameters and its operating characteristics.
7	Course Description	This course studies the fundamentals of how the design and operation of internal combustion engines affect their performance, operation, fuel requirements, and environmental impact. Topics include thermodynamics, combustion, friction phenomena and fuel properties with reference to engine power, efficiency, and emissions. Students examine the design features and operating characteristics of different types of internal combustion engines: spark-ignition, diesel, and stratified-charge.
8	Outline syllabus	
	Unit A	**Introduction to I.C Engines**
	A	Engine classification, Air standard cycles, Otto, Diesel, Stirling, Ericsson

		cycles, Actual cycle analysis.		
	B	Two and four stroke engines, SI and CI engines.		
	C	Valve timing diagram, Scavenging in 2 Stroke engines, Rotary engines, stratified charge engine.		
	Unit 2	**Fuels**		
	A	Fuels for SI and CI engine, important qualities SI engine fuels, Rating of SI engine fuels, Important qualities of CI engine fuels.		
	B	Dopes, Additives, Gaseous fuels, LPG, CNG, Biofuels, Alternative fuels for IC engines.		
	C	Thermo-chemical reactions.		
	Unit 3	**SI Engines**		
	A	Principle of carburetion, Mixture requirements, Combustion in SI engine, Flame speed, Ignition delay		
	B	Abnormal combustion and it's control, combustion chamber design for SI engines		
	C	Magneto and battery ignition systems, ignition timing and spark plug, Electronic ignition, MPFI.		
	Unit 4	**CI Engine**		
	A	Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings		
	B	Combustion in CI engines, Ignition delay, Knock and it's control, Combustion chamber design of CI Engines		
	C	Exhaust emission, norms and developments in its control in I.C Engines.		
	Unit 5	**Engine Cooling and recent development**		
	A	Lubrication**:** Engine friction, Lubrication principal, Type of lubrication, Lubrication oils, Crankcase ventilation		
	B	Supercharging and Turbocharging**:** Effect of altitude on power output, Types of supercharging		
	C	Testing and Performance: Performance parameters, Basic measurements, Testing of SI and CI engines		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Ganeshan V., I.C Engines, Tata Mc Graw Hill Publishers		
	Other References	1.Haywood B., Internal Combustion Engine Fundamentals, McGraw-Hill Science/Engineering Engineering, 2010 2.Willard W. Pulkrabek, Fundamentals of the Internal Combustion Engine, PHI Publication, 2010 3.Richard Stone, Introduction to Internal Combustion Engine, Society of		

		Automotive Engineers Inc., 2011 4.Gill, Smith,Ziurs, Fundamentals of Internal Combustion Engine, Oxford & IBH Publishing, 2010 5.Rogowsky ,COIC Engines, International Book Co., 2010 6.Engine CR software, download from http://www.sharewareconnection.com/enginecr.htm

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MEC411
2	Course Title	Refrigeration & Air Conditioning
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To develop knowledge of Reversed Carnot cycle, Bell Coleman cycle 2. To provide students an understanding of working of Vapour Compression System 3. To provide students an understanding of working of Vapour Absorption system 4. To develop knowledge of different Refrigerants 5. To develop an understanding of working of Air Conditioning systems 6. To teach students different refrigeration & air conditioning equipments
6	Course Outcomes	On successful completion of this module students will be able to: CO1 Explain the working principle of reverse Carnot Cycle, Air refrigeration systems and classify various air refrigeration cycles. CO2 Identify the various factors affecting the working and COP of vapour compression system. CO3 Distinguish between the vapour compression and vapour absorption system working and characterize different refrigerants CO4 Analyse psychometric processes and design air conditioning systems for various applications. CO5 Explain different refrigeration equipments and latest advancements. CO6 Formulate and analyze the COP of refrigeration and air conditioning systems
8	Outline syllabus	
	Unit 1	**Refrigeration & Air Refrigeration cycle**
	A	Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Reversed Carnot cycle
	B	Bell Coleman or Reversed Joule air refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P

	C	Aircraft refrigeration system, Classification of aircraft refrigeration system, Simple, Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART)		
	Unit 2	**Vapour Compression System**		
	A	Analysis of vapour compression cycle, Use of T-S and P-H charts		
	B	Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle		
	C	Actual vapour compression refrigeration cycle, vapour compression system requirement, Cascade system		
	Unit 3	**Vapour Absorption system**		
	A	Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems		
	B	Water vapour absorption system, Lithium- Bromide water vapour absorption system		
	C	Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants		
	Unit 4	**Air Conditioning**		
	A	Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes		
	B	Internal heat gain , Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP),		
	C	Thermal analysis of human body,Effective temperature		
	Unit 5	**Refrigeration & Air Conditioning Equipments and Advance Technologies**		
	A	Elementary knowledge of refrigeration & air conditioning equipments: compressors, condensers,		
	B	evaporators & expansion devices, Elementary knowledge of transmission and distribution of air through ducts and fans		
	C	Star rating and inverter technology		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. C.P. Arora, Refrigeration and Air Conditioning, TMH.		
	Other References	2. Prasad Manohar, Refrigeration and Air Conditioning, New Age Publication. 3. Stoecker, W.F.; Jones, J.W., Refrigeration and Air conditioning, McGraw-Hill Publishing Company, 1982. 4. Dossat, Roy J., Principles of Refrigeration, Prentice Hall Publishing		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MEP411
2	Course Title	Refrigeration & Air Conditioning Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	1. To teach students principle of refrigeration & air conditioning 2. To calculate cooling load of various appliances 3. To provide understanding of various components of refrigeration & air conditioning 4. To provide knowledge of selection of compressors for particular application
6	Course Outcomes	1. Understand the working principle of refrigeration and air conditioning 2. Estimate the cooling load of various appliances 3. Understand various components of refrigeration &air conditioning system 4. Understand the tubing and charging of refrigeration &air conditioning system
7	Course Description	This course focus on the understanding of working of refrigeration and air conditioning test rigs and also how to calculate the COP of test rigs. Students also do hands on practice of tubing of refrigeration and air conditioning as well as charging of refrigerants.
8	Outline syllabus	
	Unit 1	**Practical related to--- Heat Pump**
		Sub unit – a and b detailed in Instructional Plan
	Unit 2	**Practical related to –Vapour Compressor Test Rig**
		Sub unit – a and b detailed in Instructional Plan
	Unit 3	**Practical related to perform refrigerant charging process**
		Sub unit – c detailed in Instructional Plan
	Unit 4	**Practical related to- Air Conditioning**
		Sub unit – a and b detailed in Instructional Plan
	Unit 5	**Practical related to compressors**
		Sub unit – a detailed in Instructional Plan
	Mode of	Practical/Viva

	examination			
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. C.P. Arora, Refrigeration and Air Conditioning, TMH..		
	Other References	1. Prasad Manohar, Refrigeration and Air Conditioning, New Age Publication.		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MEC417
2	Course Title	Introduction to Robotics Engineering
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To be familiar with the automation and brief history of robot and applications. 2. To give the student familiarities with the kinematics of robots. 3. To give knowledge about robot end effectors and their design. 4. To learn about Robot Programming methods & Languages of robot 5. To give knowledge about various Sensors and their applications in robots.
6	Course Outcomes	On successful completion of this course students will be able to CO1:Identify with the automation and brief history of robot and it's applications. CO2: Analyze the various types of kinematic motions of robot. CO3: Associate with various robot end effectors and their design concepts. CO4:Classify the various robot Programming methods & various Languages associated with the robots. CO5: Distinguish between various Sensors and their applications in robots. CO6: Explain the various robot installation and planning process.
7	Course Description	This course covers all aspects of mobile robot systems design and programming from both a theoretical and a practical perspective. The basic subsystems of control, localization, mapping, perception, and planning are presented. For each, the discussion will include relevant methods from applied mathematics. Aspects of physics necessary in the construction of models of system and environmental behavior, and core algorithms which have proven to be valuable in a wide range of circumstances. This also includes various applications of robotics engineering.
8	Outline syllabus	
	Unit 1	**Robotics Introduction**
	A	Robot definition: Robotic systems, Laws of Robotics
	B	Role of robotics in automated manufacturing system, Robot anatomy
	C	Robot classifications and specifications.
	Unit 2	**Robot Kinematics**

	A	Robot kinematics, forward and reverse transformation, homogeneous transformations		
	B	Robot actuators and control; Pneumatic, hydraulic and electrical drives and controls used in robots.		
	C	Robot end-effectors, Mechanical, Magnetic and Vacuum grippers		
	Unit 3	**Robotic vision systems**		
	A	Robot sensors, Different types of contact and non-contact sensors, Touch Sensors & Force Sensors.		
	B	Robot vision and their interfaces		
	C	Robot languages and programming techniques.		
	Unit 4	**Applications of robots**		
	A	Applications of robots in materials handling		
	B	Machine Loading, Machine Unloading, Robot Inspection		
	C	Welding, Spray painting, Parts Joining and Parts Mating Processes		
	Unit 5	**Economy and Safety related with robots**		
	A	Economic performance and evaluation strategies.		
	B	Robot installation and planning process.		
	C	Robot safety operations, Robot Safety Features.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1.Groover, M.P., "Industrial Robotic Technology - Programming and Application", McGrawhill		
	Other References	1. Koren, Y. ,"Robotics for Engineers", McGrawhill. 2. Deb, S.R., "Robotics Technology and Flexible Automation" Tata Mc Graw Hill		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MME015
2	Course Title	Supply Chain Management
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To familiarize students with various drivers and metrics of supply chain management system 2. To provide students an understanding of different types of supply chain networks 3. To teach the basics of economics in supply chain management system 4. To teach students the basics of cross functional supply chain metrics
6	Course Outcomes	On successful completion of this course students will be able to CO1:Apply basic terminology and supply chain operations in the context of today's business environment. CO2: Analyze and study business operations and then describe the logistics/supply chain systems in oral and written presentations. CO3: Calculate effective inventory management policy, demand variability, forecasting and lead time on inventory level and cost. CO4:Evaluate the areas for improvement in logistics and supply chain operations. CO5: Illustrate the importance of strategic supply chain alliances and the impact of information Technology in SCM CO6: Integrate various modes of transportation policies.
7	Course Description	The objective of SCM is to introduce the major building blocks, major functions, major business processes, performance metrics, major decisions (strategic, tactical, and operational) and role of IT in supply chain Management.
8	Outline syllabus	
	Unit 1	Introduction
	A	Understanding the Supply Chain
	B	Supply Chain Performance: Achieving Strategic Fit and Scope

	C	Supply Chain Drivers and Metrics		
	Unit 2	Designing the supply chain network		
	A	Designing Distribution Networks		
	B	Network Design in the Supply Chain		
	C	Network Design in an Uncertain Environment		
	Unit 3	Planning and managing inventories in a supply chain		
	A	Managing Economies of Scale in a Supply Chain: Cycle Inventory		
	B	Managing Uncertainty in a Supply Chain: Safety Inventory		
	C	Determining the Optimal Level of Product Availability		
	Unit 4	Designing and planning transportation networks		
	A	The Role of Transportation in a Supply Chain		
	B	Modes of Transportation		
	C	Trade-Offs in Transportation Design		
	Unit 5	Managing cross-functional drivers in a supply chain		
	A	Sourcing Decisions in a Supply Chain		
	B	Information Technology in a Supply Chain		
	C	Coordination in a Supply Chain, Sustainability in SCM		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30 %	20%	50%
	Text book/s*	Chopra, Sunil; Meindl Peter and Kalra Dharam vir; Supply chain Management, Pearson Publcation		
	Other References	1. Scharj,P.B.,Lasen,T.S.,Managingtheglobalsupplychain,Vivabooks,NewDelhi, 2000. 2.Ayers,J.B.,Handbookofsupplychainmanagement,TheSt.Lenciepress,2000. 3.Nicolas,J.N.,Competeivemanufacturingmanagement-continuousimprovement,Leanproduction,customer focusedquality,McGrawHill,NY,1998. 4..Steudel,H.J.andDesruelle,P.,Manufacturinginthenineteen-Howtobecomeamean,leanandworld classcompetitor,VanNostrandReinhold,NY,1992.		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MME122
2	Course Title	Finite Element Method with MATLAB
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Program Elective
5	Course Objective	This course provides an introduction to Finite Element Method with a focus on 1D and 2D problems in structures, heat transfer, static and dynamics as well as writing algorithm for problem solving using MATLAB
6	Course Outcomes	On successful completion of this course, students will be able to CO1: Summarise the basic principles of elasticity, equilibrium, energy and virtual work. CO2: Formulate the finite element characteristics for solving complex structural and thermal problems CO3: Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer CO4: Analyse the various static and dynamic structural problems by formulating appropriate finite element method. CO5: Analyse the various fluid and heat transfer problems by formulating appropriate finite element method. CO6: Solvethe complex engineering problem based on finite element formulations using MATLAB.
7	Course Description	This course introduces finite element methods for the analysis of solid, structural, fluid and heat transfer problems. Applications of finite element methods, modelling and analysis of problems, and interpretation of numerical results.
8	Outline syllabus	
	Unit 1	**Introduction**
	A	Review of elasticity, mathematical models for structural problems,
	B	Equilibrium of continuum-Differential formulation
	C	Energy Approach-integral formulation, Principle of virtual work-Variational formulation.
	Unit 2	**Finite element formulation**
	A	Philosophy and general processes of finite element method.
	B	Concept of discretisation and Interpolation.
	C	Formulation of finite element characteristic matrices and vectors,

		Compatibility, Assembly and boundary condition.		
	Unit 3	**Analysis of one dimensional Structural problems**		
	A	Formulation of stiffness matrix, mass matrices and lumped load vectors.		
	B	Introduction to higher order elements and their advantages and disadvantages		
	C	Static and dynamic analysis of one dimensional axial and beam problems		
	Unit 4	**Analysis of Two dimensional Structural Problems:**		
	A	Shape functions in two dimensions, natural coordinates, Isoparametric representation, Concept of Jacobian.		
	B	Triangular and Quadrilateral elements for membrane elements.		
	C	Quadrilateral elements for plate bending elements		
	Unit 5	**FEM in Heat Transfer and Fluid Mechanics problems:**		
	A	Finite element solution for one dimensional heat conduction with convective boundaries.		
	B	Formulation of element characteristics and simple numerical problems		
	C	Finite element applications in one dimensional potential flows; Formulation based on Potential function and stream function.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Seshu P, Textbook of Finite Element Analysis, PHI. 2004		
	Other References	1 Reddy, J.N., Finite Element Method in Engineering, Tata McGraw Hill, 2007. 2. Singiresu S.Rao, Finite element Method in Engineering, 5ed, Elsevier, 2012 3. Zeincowicz, The Finite Element Method for Solid and Structural Mechanics, 4th Edition, Elsevier 2007. 4. Young W Kwon and Hyochoong Bang, The finite element method using MATLAB, 2ed, CRC Press, London. 2000.		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MMP121
2	Course Title	Finite Element Method with MATLAB
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Program Elective
5	Course Objective	This course provides an introduction to Finite Element Method with a focus on 1D and 2D problems in structures, heat transfer, static and dynamics as well as writing algorithm for problem solving using MATLAB
6	Course Outcomes	On successful completion of this course, students will be able to CO1: Summarise the basic principles of elasticity, equilibrium, energy and virtual work. CO2: Formulate the finite element characteristics for solving complex structural and thermal problems CO3: Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer CO4: Analyze the various static and dynamic structural problems by formulating appropriate finite element method. CO5: Analyze the various fluid and heat transfer problems by formulating appropriate finite element method. CO6: Solve the complex engineering problem based on finite element formulations using MATLAB.
7	Course Description	This course introduces finite element methods for the analysis of solid, structural, fluid and heat transfer problems. Applications of finite element methods, modelling and analysis of problems, and interpretation of numerical results.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	Introduction to interface of MATLAB limited to use of finite element formulation and analysis.
	Experiment 2	Formulation of finite element simulation of static and dynamic responses of uniform rod using MATLAB.
	Experiment 3	Computation of finite element simulation of static and dynamic responses of uniform beam using MATLAB

	Experiment 4	Formulation of finite element simulation of static analysis of uniform rectangular plate using MATLAB.		
	Experiment 5	Formulation of finite element simulation of dynamic analysis of uniform rectangular plate using MATLAB.		
	Experiment 6	Computation of finite element simulation of buckling analysis of uniform beam subjected to axial load using MATLAB		
	Experiment 7	Formulation of finite element simulation of buckling analysis of uniform rectangular plate subjected to in-plane loading using MATLAB.		
	Experiment 8	Computation of finite element simulation dynamic analysis of rotating uniform beam using MATLAB		
	Experiment 9	Formulation of finite element simulation of heat transfer problem of uniform rod using MATLAB.		
	Experiment 10	Computation of finite element simulation dynamic analysis of tapered beam using MATLAB		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. Young W Kwon and Hyochoong Bang, The finite element method using MATLAB, 2ed, CRC Press, London. 2000.		
	Software	MATLAB		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MEC341
2	Course Title	Additive Manufacturing
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Department Elective I
5	Course Objective	Generating a good understanding of Additive Manufacturing, its development and applications, To expose the students to different types of Additive Manufacturing Processes, materials used in AM systems and reverse engineering.
6	Course Outcomes	On completion of this course students will be able to: 1. Understand and use techniques for processing of CAD models for Additive Manufacturing 2. Understand and apply fundamentals of Additive Manufacturing techniques. 3. Use appropriate Materials /tooling for Additive Manufacturing process. 4. Use Additive Manufacturing techniques for reverse engineering.
7	Course Description	Additive Manufacturing (AM) is a process of joining materials to make objects from 3D model data , usually layer up on layer , as opposed to subtractive manufacturing methodologies, such as traditional machining. The basic principle of AM is that a model, initially generated using a three dimensional computer Aided Design system, can be fabricated directly. AM technologies have significantly evolved over the last decade. Because of their potential to extensively transform the nature of manufacturing processes by enabling " Freedom of Design " several industries have been attracted by these technologies. Using AM, manufacturing of highly complex parts can be an economically viable alternative to conventional manufacturing technologies.
8	Outline syllabus	
	Unit 1	**Introduction**
	A	World of AM, What is AM, Basic Process, Industries Using AM, Growth of AM, Installations by Countries, Technology Development.
	B	History of AM: Early history, Early solid Freeform Fabrication, Commercial Development , Chronology of AM Development
	C	Traditional Prototyping Vs Rapid Prototyping, Classification of Additive Manufacturing Processes: Additive, Subtractive, Formative, Generic AM

		process, Applications in Education and Industry.		
	Unit 2	**Principles of Additive Manufacturing Processes**		
	A	Principles of Automated Processes, AM Fundamentals: Creation of solid Models, Conversion to STL File, Slicing the File, Making or Growing the Prototype, Post processing		
	B	Data interfacing: formats (STL, SLC, CLI, AMI, LEAF, IGES, HP/GL, CT, STEP), conversation, validity checks , repair procedures		
	C	Part orientation and support generation, Support structure design, Model Slicing algorithms and contour data organization, direct and adaptive slicing, Tool path generation.		
	Unit 3	**Materials for Additive Manufacturing Processes**		
	A	Introduction ; Nature of Materials , Chemical bonding and Structure Types of Materials: Polymers, Metals, Ceramics , Composites		
	B	Liquid Based Materials : Photopolymers development , Photopolymer Chemistry		
	C	Solid Based Materials : Polymers, Metals, Composites, Ceramics		
	Unit 4	**Liquid and Solid based AM Systems**		
	A	Classification: Liquid based system-Stereolithography Apparatus SLA, details of SL process, products, Advantages and Disadvantages, Limitations, Applications and Uses.		
	B	Soild based System-Fused Deposition Modeling, Principle, Process, products, Advantages and Disadvantages, Applications and Uses, Laminated Object Manufacturing		
	C	Case Study: Fabricating a Prototype using liquid and solid based AM systems, Post processing operations.		
	Unit 5	**Powder based AM Systems**		
	A	Selective Laser Sintering-Principles of SLS process, principle of sinter bonding process, laser sintering materials , products, advantages and disadvantages applications, research and development.		
	B	Three Dimensional printing process and applications, Direct shell production casting –key strength, process, applications and uses, case studies, research and development		
	C	Laser Sintering System, e-manufacturing using laser sintering customized plastic parts, customized metal parts , e manufacturing Laser Engineered Net Shaping(LENS), Errors in AM processes : Pre-processes, processing, post processing errors, Parts building errors.		
	Mode of examination	Theory		
	Weightage	CA	MTE	ETE

	Distribution	30%	20%	50%
	Text book/s*	Noorani R, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons		
	Other References	1. Chua C K, Leong K F, Chu S L, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific. 2. Gibson D W Rosen, Brent Stucker., Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer. 3. Liou W L, Liou F W, Rapid Prototyping and Engineering applications: A tool box for prototype development, CRC Press. 4. Kamrani A K, Nasr E A, Rapid Prototyping: Theory and practice, Springer,		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: CSE		**Semester: VIIth |PSC**
1	Course Code	**ARP 401**
2	Course Title	**Problem Solving Creative Thinking and Leadership Skills**
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	
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 last threshold of his/her employability enhancement and skill building activity exercise.
6	Course Outcomes	CO1: Inculcate Innovative & Critical Thinking abilities | Problem Solving attitude CO2:Team Building & Team Synergy | Ownership | Accountability | Trust CO3: Time Management | Leadership skills | Verbal Abilities-5 CO4: Level-5 of quant , aptitude and reasoning abilities
7	Course Description	This is the final level of the program where in a student is now a step away from full readiness to step out and greet the world. This semester equips students with Innovative & Critical Thinking abilities, Problem Solving attitude,Team Building, Team Synergy,Ownership, Accountability, Trust, Time Management, Leadership skills and Verbal Abilities-5
8	Outline syllabus – ARC 401	
	Unit 1	**Campus to Corporate**
	A	Innovative & Critical Thinking | Problem Solving
	B	Team Building & Team Synergy | Ownership | Accountability | Trust
	C	Time Management | Leadership skills | Verbal Abilities-5
	Unit 2	**Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical**
	A	Puzzles | Linear Arrangement & Circular | AMCAT Practice Paper Exercise Kit
	B	E- Litmus Practice Paper Kit
	C	C- Cube Practice Test
	Unit 3	**Quantitative Aptitude**

	A	AMCAT Practice Paper Exercise Kit
	B	E- Litmus Practice Paper Kit
	C	C- Cube Practice Test
	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

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VII**
1	Course Code	MEC426
2	Course Title	Industrial Engineering & Production Management
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Department Elective
5	Course Objective	1. To familiarize students with various applications of industrial engineering. 2. To provide students an understanding of different types of industrial engineering techniques. 3. To teach the basics of statistical process control techniques. 4. To teach students the basics of Planning & Operations Management. 5. To teach students the basics of Total Quality Management.
6	Course Outcomes	CO1:Apply the basic concepts of industrial engineering in industry. CO2: Apply various work and motion study methods in actual manufacturing plant. CO3: Correlate the relation between the product and plant layout CO4:Conceptualize the Planning and Operations Management System. CO5:Explain the fundamentals and applications of quality engineering in an organization. CO6:Interpret how processes can be statistically controlled.
7	Course Description	The objective of this course is to make the students realize about the various concepts of industrial engineering and Total Quality Management in an modern manufacturing industry. After learning this course the student will be able to implement all these techniques in an industry to help his as well as the industries growth in the market.
8	Outline syllabus	
	Unit 1	Introduction to Industrial Engineering& Total Quality Management
	A	Objectives & Techniques of Industrial Engineering, Definition of Quality, Basic concepts of Total Quality Management
	B	Production and Productivity. Factors influencing Productivity, Objectives of TQM, Role of Senior Management, Quality Council.

	C	Work-Study, Work-study procedures. Strategic Planning, Deming Philosophy.		
	Unit 2	Method Study & Work Measurement		
	A	Definition, Objectives of Method Study Steps involved in Method Study, Recording Techniques, Micro-motion study		
	B	Definition and objectives of work measurement, Techniques of work measurement,		
	C	Performance rating, Computation of standard time, Work sampling.		
	Unit 3	Plant location, Plant layout& TQM Tools		
	A	Need for selecting a suitable Location, Factors influencing Plant location, Objectives of plant layout, Factors influencing plant layout		
	B	Benchmarking – Reasons to Benchmark, Benchmarking Process.		
	C	Quality Function Deployment (QFD),House of Quality,Taguchi Quality Loss Function		
	Unit 4	**STATISTICAL PROCESS CONTROL (SPC)**		
	A	The seven tools of quality		
	B	Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Sampling Inspection, Design of Sampling Plan, Control Charts for variables and attributes.		
	C	Concept of six sigma, New seven Management tools.		
	Unit 5	Planning & Managing Operations		
	A	Demand Forecasting, Value chain and Supply chain Management, Purchasing, vendor selection and material management, Materials Requirement Planning, MRP II and ERP.		
	B	Aggregate Operations Planning, Scheduling, sequencing and dispatching, Service Operations Management.		
	C	Lean systems, Constraint management – TOC, Analytical tools for DSS for operations management.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Industrial Engineering and Production Management- Martand Telsang-S.Chand & CO.		
	Other References	3. Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6. 4. Buffa, E.S., "Modern Production/Operations Management", John Wiley sons, 2003 5. Elsayed A Elsayed, Thomas O. Boucher, “Analysis and control of Production System”, Prentice Hall, 2002.		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: V
1	Course Code	MEC330
2	Course Title	Operations Research
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	The objective of this course is familiarizing the students with quantitative tools and techniques, which are frequently applied to business decision-making & to provide a formal quantitative approach to problem solving and an intuition about situations where such an approach is appropriate.
6	Course Outcomes	1. After successful completion of this course students should be able: 2. Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics. 3. Solve the problem of transporting and assignment moving/assigning the products from origins to destinations which leads to optimization of resources. 4. Understand and solve problems of queuing theory and inventory management. 5. 4. Propose the best strategy using decision making methods under uncertainty and game theory. 6. 5. Prepare cost effective solutions for network problems using PER/CPM techniques. 7. 6. Analyze and formulate practical business problems by applying operation research methods and techniques.
7	Course Description	This course covers various problem solving techniques eg Linear programming problems, transportation problems, assignment problem, Queuing theory, Inventory management, decision making and network techniques PET/CPM
8	Outline syllabus	
	Unit 1	**Introduction & Linear Programming Problems**
	A	Introduction: OR models and their applications
	B	Formulation of Linear Programming Problems, Graphical solution
	C	Simplex procedure for maximization and minimization, Duality concept
	Unit 2	**Transportation Model & Assignment Models**
	A	Mathematical formulation, Methods to find IBFS like NWCR, LCM and

		VAM		
	B	MODI method, Degeneracy and its resolution.		
	C	Assignment Model: Hungarian Method, Travelling Salesman Problem		
	Unit 3	**Queuing Model & Inventory Control**		
	A	**Queuing Model:** Introduction, Kendall's notation, Classification of queuing models, Sequencing of n jobs and 2 & 3 machines, 2 jobs and m machines		
	B	**Inventory control:** Introduction, models of inventory,		
	C	Fixed order quantity system, periodic quantity system EOQ model.		
	Unit 4	**Decision Theory and theory of games**		
	A	Decision making under certainty and uncertainty,		
	B	Decision tree		
	C	Theory of games-definition, pure and mixed strategy, algebraic and graphical Methods.		
	Unit 5	**Network Models &Computational Practices**		
	A	Basic concept, Rules for drawing the network diagram,		
	B	Applications of CPM and PERT techniques.		
	C	Cost analysis and crashing the network		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	CA components	Quizzes/Assignments/Projects/ Case studies/ Class Participation, NPTL courser/Moocs		
	Text book/s*	1. Hira & Gupta, Operations Research, S. Chand & Co. New Delhi, 2007.		
	Other References	1. Gupta P.K and Heera D.S, Operations Research: S Chand publications 2. Taha, H.A., Introduction to Operation Research, PHl Publication, 9th edition. 3. Tripathy, Production and Operation Management, Scitech Publication, 2007 edition. 4. Rajgopal, K., Operation Research, PHI Learning Pvt Ltd., 1st Edition, 2012. 6. Paneerselvam, R., Operation Research, PHI Learning Pvt Ltd.,2nd Edition, 2009. 7. Use MATLAB Software– MATLAB R2011b; Version 8.1, and Microsoft Office Excel 2007 or2012.		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VII
1	Course Code	MEC410
2	Course Title	Power Plant Engineering
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	D E
5	Course Objective	1. To provide students an understanding of various energy resources, their economic implications and present Indian scenario 2. To develop knowledge of science of energy conversion. 3. To provide students an understanding of working of thermal power plant 4. To provide students an understanding of working of hydroelectric and gas turbine power plant 5. To teach students about different renewable energy generation systems.
6	Course Outcomes	CO1- On successful completion of this module students will be able to: CO2- Explain energy scenario and its economics in India CO3- Explain types, working principle, components and application of conventional power plants CO4- Analyse the thermodynamic cycles and performance characterises of conventional power plants. Explain different methods of fuel combustion and gasification CO5- Appraise the unconventional power sources and their limitations. CO6- Select the suitability of a power generation system for different locations.
7	Course Description	This course focuses on the different methods of power generation, their merits, demerits and limitations. It also focuses on mechanism of various renewable energy generation systems and future trends in power generation science.
8	Outline syllabus	
	Unit 1	**Introduction and Boilers**
	A	Energy sources for generation of electric power. Types of power plants-

		their special features and applications		
	B	Various power plants in India		
	C	Introduction to Boilers: mountings and accessories		
	Unit 2	**Steam power plant**		
	A	Layout of steam power plant, rankine cycle		
	B	Mean temperature of heat addition, Carnotization of Rankine cycle, Second Law Efficiency		
	C	Effect of variation of steam condition on thermal efficiency of Stem power plant (Reheat and Regeneration),		
	Unit 3	**Combustion Method and Gasification**		
	A	Pulverized coal firing systems		
	B	Fluidized bed combustion, fly ash and bottom ash handling		
	C	Gasification, IGCC		
	Unit 4	**Gas Turbine Power Plant**		
	A	Gas Turbine power plant introduction, advantages and disadvantages.		
	B	Closed loop and open loop Brayton cycle, gas turbine with intercooler		
	C	Gas turbine with reheat and regeneration, Cogeneration, Combined cycle.		
	Unit 5	**Hydro-electric Power Plant and introduction to non-conventional power generation**		
	A	Introduction, Hydrological cycle, Hydrograph. Selection of site for hydroelectric power plant, Layout of a hydroelectric power plant,		
	B	Elements of hydro electric power plant, Classification of hydroelectric power plant.		
	C	Introduction to non-conventional, solar thermal power plant, wind turbine power generation.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book(s)*	1. Nag, P.K., Power Plant Engineering, Tata Mcgraw Hill Education Private Limited,2010		
	Other References	1. Elanchezhian C., Saravanakumar L., Vijaya Ramnath B., Power Plant Engineering, I.K. International Publishing House Pvt., Limited, 2007 2. Sharma P.C., Power Plant Engineering, S. K. Kataria & Sons, 2009 Download Intergraph software from http://intergraph.com		

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School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VII**
1	Course Code	MEC441
2	Course Title	Gas Turbine and Compressor
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. Familiarity with common types of gas turbines and compressors 2. To develop knowledge of thermodynamic cycles of turbine and compressors 3. To develop Working knowledge of the basic operations, design requirements and, performance analysis of gas turbines and compressors
6	Course Outcomes	On successful completion of this module students will be able to: 1. Explain the working principle of gas turbine and classify various gas turbine cycles. 2. Analyse ideal gas turbine cycle with heat exchanger, intercooler, reheat and regeneration. 3. Analyse Practical gas turbine cycle and its performance 4. Analyse the thermodynamic, velocity profile, flow and losses of centrifugal compressor 5. Analyse stage efficiency, flow through blade rows, velocity triangle and degree of reaction axial flow compressor 6. Characterize the performance parameters of gas turbine and compressors
7	Course Description	This subject deals with the working and thermodynamics of gas turbine and compressors. This course covers ideal and actual cycle analysis of gas turbine, analysis of centrifugal and axial flow compressors.
8	Outline syllabus	
	Unit 1	**Introduction**
	A	Simple gas turbine, assumptions of ideal cycle analysis, open cycle and close cycle arrangements, cycle efficiency

	B	Basic requirements of the working medium, properties of various working medium,		
	C	its applications , Comparison of gas turbine with reciprocating engine		
	Unit 2	**Gas Turbine: Ideal cycle and Their Analysis**		
	A	Heat exchange cycle, reheat cycle, reheat and heat exchange cycle		
	B	Intercooled cycle, intercooled cycle with heat exchanger , intercooled with reheat cycle		
	C	Intercooled cycle with reheat and heat exchanger, regenerative cycle		
	Unit 3	**Gas Turbine: Practical Cycle and Their Analysis**		
	A	Assumptions, compressor and turbine efficiency, pressure and flow loses		
	B	Heat Exchanger Effectiveness, polytropic efficiency		
	C	Effect of variable specific heat, mechanical losses, loss due to incomplete combustion, performance of actual cycle		
	Unit 4	**Centrifugal Compressors**		
	A	Essential parts of centrifugal compressor, principle of operation, ideal energy transfer,		
	B	Blades shape and velocity profile, analysis of flow through compressor, Losses in centrifugal compressor		
	C	Volute casting, performance parameters, compressor characteristics, Surging and choking		
	Unit 5	**Axial Flow Compressor**		
	A	Geometry and working principle, stage velocity triangle, work done factor		
	B	h-s diagram, compressor stage efficiency, performance coefficient, degree of reaction		
	C	Flow through blade rows, flow losses, stage losses, performance characteristics, comparison between axial and centrifugal compressor		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30 %	20%	50%
	Text book/s*	1. Ganesan,V.,GasTurbines,TataMcGraw-Hill		
	Other References	1. Cohen,H.,Rogers,G.E.C.,andSaravanamuttoo,H.I.H.,GasTurbineTheory, Longman 2. Yahya,S.H.Turbines,CompressorsandFans,Tata McGraw-Hill		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch:		**Semester:**
1	Course Code	MEC342
2	Course Title	Energy Conservation and Management
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	
5	Course Objective	1. To understand and appreciate the energy crisis and environmental concerns associated with the energy management, and the importance of energy conservation. 2. To know the techniques of energy analysis and the associated energy efficient technologies for the routinely used thermal and electrical energy systems. 3. To understand the energy management systems and their essential elements. 4. To acquire the knowledge and the basic skills for energy monitoring, energy bench marking, energy action planning and energy auditing.
6	Course Outcomes	After the successful completion of course students will be able to: CO1: become aware of the energy crisis, and of environmental and sustainability concerns associated with the energy management. CO2: appreciate the importance of energy conservation and having the knowledge of energy conservation strategies and methods. CO3: understand the Energy Management Systems (EnMS) and their essential elements. CO4: become aware of the Energy Conservation Act, 2001, and of the legal energy requirements applicable to the routinely used thermal and electrical energy systems. CO5: apply the knowledge and basic skills for energy monitoring, energy bench marking and energy auditing.
7	Course Description	This course introduces students to understand the energy crisis associated with the energy management and the importance of energy conservation. They will also learn the techniques of energy analysis used for thermal and electrical energy systems, understand the energy management systems and their essential elements. Students will also acquire the basic skills for energy monitoring and energy auditing.
8	Outline syllabus	
	Unit 1	**Introduction**
	A	Energy resources; New and renewable energy resources; Energy forms and

		energy technologies;		
	B	Energy and environmental concerns; Energy scenario and energy crisis; energy resources management and energy conservation – principles;		
	C	Potential areas industries; Agriculture and municipal for energy conservation; Conservation methods.		
	Unit 2	**Energy efficient technologies in thermal systems**		
	A	Fuels and combustion; Boilers and turbines; Cogeneration and combined cycles;		
	B	Circulating cooling water systems; Steam system and condensate systems and insulation; Heat exchangers; Multiple effect evaporations;		
	C	Furnaces; Thermo-compressors and mechanical vapour compressors; Waste heat recovery and reuse.		
	Unit 3	**Energy efficient technologies in other systems**		
	A	Electrical motors and drives;		
	B	Pumps; Fans and Blowers; Air compressors and compressed air systems;		
	C	Buildings and space heating and lighting systems; HVAC systems.		
	Unit 4	**Energy management**		
	A	Supply side and demand side management; Energy conservation methods;		
	B	Energy management systems; Energy monitoring; Energy review and energy bench marking;		
	C	Energy action planning; Energy auditing.		
	Unit 5	**Energy policy and legislation**		
	A	Energy policy; Energy conservation act; 2001;		
	B	Energy managers and energy auditors;		
	C	Energy labelling and energy standards.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book(s)*	1. Eastop TD, Croft DR, Energy Efficiency for Engineers and Technologists; Longman and Scientific and Technical (1988). 2. K.V Sharma, P Venkatasheshaiah (2011) Energy management and Conservation, I.K International publishing house New Delhi.		
	Other References	1. White LC, Industrial Energy Management and Utilization; Hemisphere Publishers; (1988). 2. Indian Energy Board-2012; World Energy Council. 3. Y.P abhi, Shashank Jain (2012), Hand book of energy audit and environment management, TERI Press 4. Course Material for Energy Audit and Managers Exam (2005), (www.energymanagertraining.com), Vol. 1-4. 5. Bureau of Energy Efficiency Reference book: No.1, 2, 3 4		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch:		Semester:
1	Course Code	MEC442
2	Course Title	Maintenance Engineering
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Electives
5	Course Objective	1. To enable the student to understand the principles, functions and practices o activities. 2. To develop ability in formulating suitable maintenance strategies to achieve system. 3. To introduce the different maintenance categories and failure analysis tools. 4. To equip with essential system diagnosis techniques so as to identify and tak on error symptoms and causes of failures. 5. To illustrate the techniques used for maintenance management. 6. To empower with the skills to manage a manufacturing system to achieve co availability for production.
6	Course Outcomes	CO1: Understand the relationship of key concepts in reliability engineering and application to maintenance strategies in a manufacturing environment CO2: Establish maintenance strategies according to system characteristics and design transition programs to implement these strategies. CO3: Understand essential system diagnosis techniques so as to identify and take appropriate actions on error symptoms and causes of failures. CO4: Understand the techniques used for maintenance management CO5: Empower with the skills to manage a manufacturing system to achieve continuous system availability for production CO6: Ability is developed in formulating suitable maintenance strategies to achieve reliable manufacturing system.

7	Course Description	The objective of Maintenance Engineering is to enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities and to explain the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements and also to illustrate some of the simple instruments used for condition monitoring in industry.		
8	Outline syllabus			
	Unit 1	PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING		
	A	Basic Principles of maintenance planning – Objectives and principles of planned maintenance activity – Importance and benefits of sound Maintenance systems		
	B	Reliability and machine availability – MTBF, MTTR and MWT		
	C	Factors of availability – Maintenance organization – Maintenance economics.		
	Unit 2	MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE		
	A	Maintenance categories – Comparative merits of each category –		
	B	Preventive maintenance, maintenance schedules, repair cycle		
	C	Principles and methods of lubrication – TPM.		
	Unit 3	CONDITION MONITORING		
	A	Condition Monitoring – Cost comparison with and without CM		
	B	On-load testing and offload testing – Methods and instruments for CM		
	C	Temperature sensitive tapes – Pistol thermometers – wear-debris analysis.		
	Unit 4	REPAIR METHODS FOR BASIC MACHINE ELEMENTS		
	A	Repair methods for beds, slideways, spindles, gears, lead screws and bearings		
	B	Failure analysis – Failures and their development		
	C	Logical fault location methods – Sequential fault location.		
	Unit 5	REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT		
	A	Repair methods for Material handling equipment		
	B	Equipment records –Job order systems		
	C	Use of computers in maintenance.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Srivastava S.K., “Industrial Maintenance Management”, – S. Chand and Co., 1981 • Venkataraman .K “Maintancence Engineering and Management”, PHI Learning, Pvt. Ltd., 2007		
	Other	• Bhattacharya S.N., “Installation, Servicing and Maintenance”, S. Chand and		

	References	Co., 1995 ● White E.N., "Maintenance Planning", I Documentation, Gower Press, 1979. ● Garg M.R., "Industrial Maintenance", S. Chand & Co., 1986. ● Higgins L.R., "Maintenance Engineering Hand book", McGraw Hill, 5th Edition, 1988. ● Armstrong, "Condition Monitoring", BSIRSA, 1988. ● Davies, "Handbook of Condition Monitoring", Chapman &Hall, 1996. ● "Advances in Plant Engineering and Management", Seminar Proceedings – IIPE, 1996.

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: ME with Automobile Engineering		**Semester: VI**
1	Course Code	MEC313
2	Course Title	Alternate Fuels and Energy Systems
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	The objective of this course is to make the students familiar with the current need of various alternate fuels available and their availability/production processes. The course deals with the compatibility, storage, transportation, piping, dispensing and safety aspects of the major alternate fuels in present and future for the electrical and solar powered vehicles
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1: Recognize alternate fuels requirement, types and its classifications. CO2:Explain the technical aspects and feasibility of Alcohols as an alternate fuel. CO3: Explain the technical aspects and feasibility of CNG, LPG and Hydrogenas an alternate fuel. CO4: Explain the technical aspects and feasibility ofVegetable Oils and Bio gas CO5: Apply the knowledge of high energy and power density batteries in electric vehicles. CO6: Demonstrate the Hybrid vehicle, Solar powered vehicles.
7	Course Description	This course introduces students to deal with the introduction to major alternate fuels. The course includes the comprehensive technical information, production and safety aspects, vehicle performance and **emission characteristics** etc of alternate fuels of future in I.C Engines, Electrical and Hybrid vehicles.
8	Outline syllabus	
	Unit 1	**Introduction**
	A	Estimation of petroleum reserve, Need for alternate fuel, Availability and properties of alternate fuels
	B	General use of alcohols LPG-Hydrogen-Ammonia, CNG, and LNG-Vegetable oils and Biogas
	C	Merits and demerits of various alternate fuels.

	Unit 2	**Alcohols**		
	A	Properties as engine fuels, Manufacturing of alcohols		
	B	Combustion characteristics in engines, **Emission characteristics**, Alcohols and gasoline blends		
	C	Material compatibility, storage, transportation, piping and dispensing and safety aspects		
	Unit 3	**CNG, LPG and Hydrogen**		
	A	**CNG:** Availability and production, Vehicle Performance and **Emission Characteristics**, Modification required in engines to use CNG, Material compatibility, storage, transportation, piping, dispensing and safety aspects **and preventive maintenance**		
	B	**LNG**: Availability and production, Vehicle Performance and **Emission Characteristics**, Material compatibility, storage, transportation, piping, dispensing and safety aspects **and preventive maintenance**		
	C	**Hydrogen**: Availability and production, Vehicle Performance and **Emission Characteristics**, Material compatibility, storage, transportation, piping , dispensing and safety aspects **and preventive maintenance**		
	Unit 4	**Vegetable Oils and Bio gas**		
	A	Various vegetable oils for engines , Bio diesel		
	B	Esterification, Performance and **emission characteristics**		
	C	**Bio gas :** production, storage and dispensing, vehicle performance **and maintenance**		
	Unit 5	**Electrical and Solar Powered Vehicles**		
	A	Layout of an electric vehicle, Advantage and limitations, Specifications, System components		
	B	Electronic control system, High energy and power density batteries, **Battery Thermal Management System**		
	C	Hybrid vehicle, Solar powered vehicles		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Dayal, M., "Energy today & tomorrow", I & B Horishr India,1982 2. The properties and performance of modern alternate fuels SAE paper No 841210. 3. Bechtold.R.L., "Alternative Fuels Guide Book", SAE, 1997 4. S S Thipse, Alternative Fuels, JAICO PUBLISHING HOUSE		
	Other References	1. Alcohols and Motor fuels progress in technology, Series No.19, SAEPublicartion USA 1980. 2. SAE paper Nos.840367, 841156,841333,841334 3. Nagpal, "Power Plant Engineering", Khanna Publishers,1991		

		4. The properties and performance of modern alternate fuels SAE paper no. 841210 5. Fuel & combustion analysis software- http://thermofluids.sdsu.edu/testhome/Test/intro/exCombustionP.html

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical ENgineering		Semester: VI
1	Course Code	MEP411
2	Course Title	RAC lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-1
	Course Status	Compulsory
5	Course Objective	1. To teach students principle of refrigeration & air conditioning 2. To calculate cooling load of various appliances 3. To provide understanding of various components of refrigeration & air conditioning 4. To provide knowledge of selection of compressors for particular application
6	Course Outcomes	5. Understand the working principle of refrigeration and air conditioning 6. Estimate the cooling load of various appliances 7. Understand various components of refrigeration &air conditioning system 8. Understand the tubing and charging of refrigeration &air conditioning system
7	Course Description	This course focus on the understanding of working of refrigeration and air conditioning test rigs and also how to calculate the COP of test rigs. Students also do hands on practice of tubing of refrigeration and air conditioning as well as charging of refrigerants.
8	Outline syllabus	
	Lab expt.1	To study Mechanical heat pump and find its COP
	Lab expt.2	Study of Simple vapour compression system
	Lab expt.3	To determine COP and Tonnage Capacity of air conditioning test rig
	Lab expt.4	To determine COP and Tonnage Capacity of refrigerator test rig
	Lab expt.5	To study cut section model of single action/double acting Reciprocating Compressor
	Lab expt.6	To study cut section model of Van type Rotary Compressor
	Lab expt.7	To study cut section model of Roller type Rotary Compressor
	Lab expt.8	To perform Flaring and Swaging operation in a pipe
	Lab expt.9	To perform tube section formation with brazing and union joint

	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. C.P. Arora, Refrigeration and Air Conditioning, TMH..		
	Other References	2. Prasad Manohar, Refrigeration and Air Conditioning, New Age Publication.		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: V
1	Course Code	MEC333
2	Course Title	Hydraulics and Pneumatics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	The objective of this course is to impart knowledge on principles and operations of fluid power devices used in the design of hydraulic and pneumatic circuits.
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1: Apply the principles of various fluid properties and identify the appropriate fluid power system for particular application. CO2: Recognize the suitable pump and actuators for fluid power systems. CO3: Explain the principle, working of fluid power actuators and the cushioning mechanisms in design of hydraulic systems. CO3: Select various control valves such as pressure control, flow control, direction control valves and use them in hydraulic and pneumatic circuit development. CO4:Design and analyze pneumatic circuits, speed control circuits, synchronizing circuit, pneumo-hydraulic circuit, Sequential circuit design for simple applications using cascade method. CO5: Select the appropriate control system such as electrical, electronics, and PLC to control the fluid power system. CO6: Analyze the failure and troubleshooting of the system and components related to hydraulic and pneumatics
7	Course Description	This course introduces students to deal with the hydraulic and pneumatic principles and understand the importance of components and equipment. This course expands on the mechanical engineering student's to identify, analyze, describe and design the basic circuits of hydraulic / pneumatic systems. This course is intended to deal with theprinciple, working of fluid power actuators to enable students to understand the control components, various flow control valves and types of accumulators.
8	Outline syllabus	
	Unit 1	**Fluid Power Systems and Fundamentals**
	A	Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems

	B	Properties of hydraulic fluids, General types of fluids, Fluid power symbols. Basics of Hydraulics, Applications of Pascal's Law, Laminar and Turbulent flow (Reynold's number)		
	C	Darcy's equation, losses in pipe, valves and fittings		
	Unit 2	**Hydraulic System and Components**		
	A	Sources of Hydraulic Power: Pumping theory, Pump classification, Gear pump, Vane Pump, piston pump, construction and working of pumps, pump performance, Variable displacement pumps		
	B	Fluid Power Actuators: Linear hydraulic actuators, types of hydraulic cylinders, single acting, double acting special cylinders like tandem, rodless, telescopic		
	C	Cushioning mechanism, Construction of double acting cylinder, Rotary actuators, Fluid motors, Gear, Vane and Piston motors		
	Unit 3	**Design of Hydraulic Circuits**		
	A	Construction of Control Components : Directional control valve like 3/2 way valve, 4/2 way valve, shuttle valve, check valve, pressure control valve, pressure reducing valve, sequence valve		
	B	Flow control valve, fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram. Accumulators and Intensifiers		
	C	Types of accumulators, accumulators circuits, sizing of accumulators, intensifier, applications of intensifier, Intensifier circuit		
	Unit 4	**Pneumatic Systems and Components**		
	A	Pneumatic Components: Properties of air, compressor, filter, regulator, lubricator, air control valves, quick exhaust valves, pneumatic actuators		
	B	Fluid power circuit design, speed control circuits, synchronizing circuit, pneumo-hydraulic circuit		
	C	Sequential circuit design for simple applications using cascade method.		
	Unit 5	**Design of Pneumatic Circuits**		
	A	Servo systems: Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves		
	B	Fluidics – Introduction to fluidic devices, simple circuits, Introduction to Electro Hydraulic Pneumatic logic circuits		
	C	PLC applications in fluid power control. Fluid power circuits; failure and troubleshooting.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Esposito, A. , "Fluid Power with Applications", Pearson Education, 2005		
	Other References	1. Srinivasan.R, "Hydraulic and Pneumatic controls", Tata McGraw - Hill Education (2008)		

		2. Majumdar,S.R., "Oil Hydraulics Systems- Principles and Maintenance",Tata McGraw-Hill, 2001 3. Download FluidSIM Software for Circuit Simulation "http://fluidsim.com"

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: V**
1	Course Code	**MEP333**
2	Course Title	Hydraulics and Pneumatics Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	The objective of this course is to impart knowledge on principles and operations of fluid power devices used in the design of hydraulic and pneumatic circuits.
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1:Recall various fluid properties and identify the appropriate fluid power system for particular application. CO2:Recognize the suitable pump and actuators for particular application CO3: Understand thecomponents in hydraulic circuit design and use them in hydraulic circuit development. CO4: Apply the knowledge of pneumatic components for hydraulic circuit design. CO5: Design and interpret hydraulic and pneumatic circuits related to industrial applications.
7	Course Description	This course introduces students to deal with the hydraulic and pneumatic principles and understand the importance of components and equipment. This course expands on the mechanical engineering student's to identify, analyze, describe and design the basic circuits of hydraulic / pneumatic systems. This course is intended to deal with theprinciple, working of fluid power actuators to enable students to understand the control components, various flow control valves and types of accumulators.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	To demonstrate the motion of a single acting cylinder and double acting cylinder.
	Experiment 2	To demonstrate the use of memory valve and quick exhaust valve with double acting cylinder.
	Experiment 3	To demonstrate the use of dual pressure valve and shuttle valve with single acting cylinder.
	Experiment 4	To perform AND & OR logic for forward stroke of a double acting

		cylinder using two manual control.		
	Experiment 5	To control the speed of a double acting cylinder using metering in and metering out flow control valve (Speed controlling operation).		
	Experiment 6	To perform single and multicycle operation of a double acting cylinder using roller lever valve and memory valve.		
	Experiment 7	To perform continuous operation of a double acting cylinder using double solenoid valve.		
	Experiment 8	To operate two double acting cylinders electro pneumatically (Sequence of operation: A+B+A-B-).		
	Experiment 9	To demonstrate the use of an inductive sensor with double acting cylinder and double solenoid valve.		
	Experiment 10	To demonstrate the auto reset of a counter after the operation of a double acting cylinder after 'n' cycles using double solenoid valve		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	2.		

School: SET		Batch :2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: ME with Automobile Engineering		Semester: V
1	Course Code	MEC314
2	Course Title	Automotive Transmission
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	In this course, Student will be able to learn the necessity of the transmission of power. Furthermore, They can able to apply elementary mathematical formulate, dynamics of machines, fluid mechanics and machine design involved in the basic transmission systemand also formulate as well as solve typical problems based on different modes of power transmission. Eventually, they will be able to gain the knowledge on the latest technology of Drive and Axle in automobile.
6	Course Outcomes	The students will be able to: CO1: Demonstrate the classification, principle and working of different types of Clutches. CO2: Summarize the necessity of different types of Gear Box in cars. CO3: Explain the concept of Final drive, Drive line and Axle of different models of car. CO4: Classify the technical requirements of Hydrodynamic Drive System in automobile CO5: Compare the technical requirements of Hydrostatic Drive System in automobile CO6: Express the concept of Automatic overdrive, Hydraulic control system of new launched cars.
7	Course Description	This course prepares students to install, remove, maintain and repair this system in an automobile. This course introduces students to transmissions, transaxles and transmission services. It also discusses transmission theory as well as the maintenance of a latest vehicle's transmissions and transaxles.
8	Outline syllabus	
	Unit 1	**Introduction and Clutch**
	A	Need for Transmission system, Classification of Transmission systems, Front wheel, Rear wheel and Four wheel drive.
	B	Clutches: Principle, functions, general requirements, types of clutches: cone clutch, single-plate clutch, diaphragm spring clutch, multi-plate clutch.

	C	Centrifugal and electromagnetic clutch, clutch lining materials.		
	Unit 2	**Gear Box**		
	A	Necessity of gear box, Resistance to motion of vehicle, Requirements of gear box, Functions of gear box		
	B	Types of gear box: Principle, construction and working of Sliding mesh, Constant mesh and Synchromesh gear box, applications of helical gears.		
	C	Gear selector mechanism, Lubrication of gear box.		
	Unit 3	**Drive Line, Final Drive &Rear Axle**		
	A	Propeller shaft-universal joints, hooks and constant velocity U.J., Purpose of final drive, need of differential, Constructional Details of differential unit, Non slip differential.		
	B	Function of rear axle, Types of loads acting on rear axle, Types of rear wheel drive: Hotchkiss drive & torque tube drive		
	C	Types of rear axle support: semi-floating, full floating, three quarter floating,		
	Unit 4	**Hydrodynamic & Hydrostatic Drive**		
	A	Fluid coupling, Principle of operation, Constructional details, Torque capacity, Performance characteristics, Torque converter-Principle of operation, constructional details, performance characteristics,		
	B	Hydrostatic drive : principle, types, advantages, limitations – Comparison of hydrostatic drive with hydrodynamic drive		
	C	Construction and working of typical Janny hydrostatic drive		
	Unit 5	**Power Transmission**		
	A	Wilson Gear box, Ford - T-model gear box		
	B	Continuous variable transmission (CVT)–operating principle, basic layout and operation, Advantages and disadvantages		
	C	Automatic over drive, Hydraulic control system for automatic transmission.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Crouse,W.H.,Anglin, D.L, "Automotive Transmission and Power Trains construction", McGraw-Hill, 1976		
	Other References	2. Heldt.P.M., " Torque converters ", Chilton Book Co., 1992. 3. Newton and Steeds, " Motor vehicles ", llliffe Publishers, 1985. 4. Judge.A.W., " Modern Transmission systems ", Chapman and Hall Ltd., 1990. SAE Transactions 900550 & 930910.		

COURSE ARTICULATION MATRIX

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: ME with Automobile Engineering		**Semester: VI**
1	Course Code	MEP360
2	Course Title	Automobile Engineering Lab
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Status	Compulsory
5	Course Objective	To make the student able to gain knowledge about the various components of petrol engine and diesel engine by dismantling and assembling the parts like carburetor,fuel system, Cooling system etc and we have the multi cylinder diesel and petrol engines for easy learning. Although, the student can learn about the various electrical components of an automobile and the wiring circuits and to test the starter motor, ignition system, batteries etc.
6	Course Outcomes	After successful completion of the course, the students will able to: CO1: Distinguish the basic parts of an engine in automobile. CO2: Identify the components of an engine in Maruti Suzuki 800 CC car. CO3:Explain the operation of Lubrication and Fuel System of SI and CI Engine. CO4:Summarize the operation of Engine Cooling and Ignition System CO5: Demonstrate the principles of Engine management systems. CO6: Determine the components of automotive electrical and electronics in modern vehicles.
7	Course Description	This course covers the theory, construction, inspection, diagnosis, and repair of internal combustion engines and related systems. Topics include fundamental operating principles of engines and diagnosis, inspection, adjustment, and repair of automotive engines using appropriate service information. Upon completion, students should be able to perform basic diagnosis, measurement and repair of automotive engines using appropriate tools, equipment, procedures, and service information.
8	Outline syllabus	
	List of Experiments	

	Experiment 1	To dismantle engine block, cylinder head and peripherals.		
	Experiment 2	Scraping, refurbishing of engine block, cylinder head and. Peripherals fewer than 4 modes of fluid pressure washing.		
	Experiment 3	To study the fuel supply of a petrol/CNG engine.		
	Experiment 4	To study the fuel supply of a diesel engine.		
	Experiment 5	To study engine's lubricating system.		
	Experiment 6	To study engine's cooling system.		
	Experiment 7	To study ignition system.		
	Experiment 8	To assemble various engine sub systems and components.		
	Experiment 9	Unmount the existing engine from the car's engine compartment and remount the assembled one by connecting all hoses, wire harnesses, couplers, relays, sensors and switches		
	Experiment 10	To study engine management system.		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. . Crouse, W.H., and Anglin, D.L., Automotive Mechanics, Tata McGraw Hill, New Delhi, 2005. 2. Heitner, J., Automotive Mechanics, Affiliated South West Press, New Delhi, 2000.		
	Software	ANSYS		

School: SET		**Batch :2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MEP324
2	Course Title	I C Engine Laboratory
3	Credits	2
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	The objective of this course is to make the students familiar with the internal combustion engines, thermodynamic analysis of S.I and C.I engines, recent developments and performance evaluation of I.C engines.
6	Course Outcomes	CO1: Analyse different classes of IC Engines with the respective thermodynamic process and understand the important developments in IC engines. CO2: Explain the fuel quality requirements and alternate fuels for SI and CI engines CO 3: Explain the combustion, lubrication and fuel injection processes in SI engines CO4:Explain the combustion, lubrication and fuel injection processes in CI engines CO5: Measure and calculate the engine performance parameters and its operating characteristics.
7	Course Description	After completing this course, students will have a practical understanding of Internal Combustion Engines, including overview of IC Engines and its different types of combustion process in SI Engine, CI Engine. This will enable the students to diagnose the normal and abnormal combustion with performance evaluation of IC Engine heat balance sheet.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	To study the two stroke single cylinder petrol engine
	Experiment 2	To study the four stroke single cylinder petrol engine
	Experiment 3	To study the four stroke four cylinder diesel engine
	Experiment 4	To perform Experiment on the four cylinder four stroke petrol engine test rig.(Morse Test)
	Experiment 5	To perform efficiency experiments on the single cylinder two stroke Petrol engine test rig

	Experiment 6	To perform experiment on the single cylinder four stroke Diesel engine test rig.		
	Experiment 7	To study the ignition system of two stroke engine		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	3.		

School: SET		**Batch : 2019-2023**			
Program: B.Tech		**Current Academic Year: 2019-2020**			
Branch: ME		**Semester: VII**			
1	Course Code	**AUT463**			
2	Course Title	**Major Project I**			
3	Credits	3			
4	Contact Hours (L-T-P)	0-0-6			
	Course Status	Compulsory			
5	Course Objective	The course provides an in-depth understanding and skill in the field of Mechanical Engineering and its associated fields.			
6	Course Outcomes	After successful completion of the course, the students will be able to: CO1:Identify a topic in advanced areas of mechanical engineering CO2: Review literature to identify research gaps and define objectives CO3: Evaluate the feasibility of project. CO4: Generate and implement innovative ideas for social benefit. CO5: Develop a prototype/models, experimental set up and software systems necessary to meet the objectives			
7	Course Description	The course provides an in-depth understanding and skill in the field of Mechanical Engineering and its associated fields.			
	Mode of examination	Project report and Viva-Voce			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	As per the field/specialization			
	http:/	Google scholar, Research gate.			

School: SET		**Batch : 2019-2023**			
Program: B.Tech		**Current Academic Year: 2019-2020**			
Branch: Mechanical Engineering		**Semester:VIII**			
1	Course Code	**AUT464**			
2	Course Title	**Major Project II**			
3	Credits	8			
4	Contact Hours (L-T-P)	0-0-16			
	Course Status	Compulsory			
5	Course Objective	The course provides an in-depth understanding and skill in the field of Mechanical Engineering and its associated fields.			
6	Course Outcomes	After successful completion of the course, the students will be able to: CO1:Identify the methodologyto carry the experiments towards significant outcome. CO2: Reorganize the procedures with a concern for society, environment and ethics CO3: Analyze and discuss the results to draw valid conclusions CO4: Prepare a report as per the recommended format and defend the work. CO5: Explore the possibility of publishing papers in symposium/conference proceedings.			
7	Course Description	The course provides an in-depth understanding and skill in the field of Mechanical Engineering and its associated fields.			
	Mode of examination	Project report and Viva-Voce			
	Weightage Distribution	CA	MTE	ETE	
		60%	0%	40%	
	Text book/s*	As per the field/specialization			
	http:/	Google scholar, Research gate.			

School: SET		Batch : 2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: ME		Semester: V
1	Course Code	MEC329
2	Course Title	Automotive Electrical and Electronics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To teach the students of mounting the electrical and electronics automotive parts in automobile and their functions even. 2. To provide students an understanding of uses of batteries and their accessories. 3. To teach the basics of electrical and electronics concept. 4. To teach students the use of sensors and activators
6	Course Outcomes	At the end of the course, the student will be able to: CO1: Apply the concept of characteristics and accessories of batteries in modern vehicle. CO2: Summarizes the concept of Lighting system and also the preventive methods of automobile CO3: Demonstrate the idea of utilization and conceptualization of Starting system in various cars. CO4:Describe the detailed procedure of Charging System with basic principle. CO5: Distinguish and demonstrate the conceptualization of the fundamental of Automotive Electronics CO6: Explain and distinguish the various types of sensors which is often used in new modern Vehicles.
7	Course Description	To provide the knowledge to the students is the principles of operation and constructional details of various Automotive Electrical and Electronic Systems like Batteries, Starting System, Charging System, Ignition System, Lighting System and Dash Board Instruments.
8	Outline syllabus	
	Unit 1	**BATTERIES AND ACCESSORIES**
	A	Principle and construction of lead acid battery, characteristics of battery, rating capacity and efficiency of batteries. various tests on batteries, maintenance and charging
	B	Lighting system: insulated and earth return system, details of head light and

		side light.		
	C	LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trafficator.		
	Unit 2	**STARTING SYSTEM**		
	A	Starting Condition, behaviour of starter during starting, series motor and its characteristics.		
	B	Principle and construction of starter motor.		
	C	Working of different starter drive units, care and maintenance of starter motor, starter switches.		
	Unit 3	**CHARGING SYSTEM**		
	A	Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation		
	B	Cut out, voltage and current regulators, compensated voltage regulator, alternators.		
	C	Principle and constructional aspects and bridge rectifiers, new developments.		
	Unit 4	**FUNDAMENTALS OF AUTOMOTIVE ELECTRONICS**		
	A	Electronic engine management system, electromagnetic interference suppression, electromagnetic compatibility		
	B	Electronic dashboard instruments, onboard diagnostic system, security and warning system.		
	C	Magneto–Ignition System.		
	Unit 5	**SENSORS AND ACTIVATORS**		
	A	Types of sensors: Sensor for speed, throttled position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application.		
	B	Solenoids, stepper motors relay.		
	C	Introduction to Microprocessor & Applications in Automobiles.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Young A.P. & Griffiths. L. “Automotive Electrical Equipment”, ELBS & New Press - 1999.		
	Other References	2. William, B. R. “Understanding Automotive Electronics”, Butter worth Heinemann Woburn, 5th edition – 1998. 3. Bechhold “Understanding Automotive Electronics”, SAE, 1999 4. Crouse, W.H “Automobile Electrical Equipment”, McGraw-Hill Book Co., Inc., New York, 3rd edition, 1986. Software: Workbench 5.12 (www.robometricschool.com)		

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: ME with Automobile Engineering		**Semester: VI**
1	Course Code	MEC420
2	Course Title	Robot and Its applications
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To familiarize the students with the basic kinds of robots, the transmission systems used to drive robots and the sensors used in robots. 2. To introduce to them the elementary terminologies used in robots. 3. To make them understand the forward and reverse kinematics of robots. 4. To introduce to them the actuators and the various types of controls used in robots. 5. To make them understand the various end effectors used in robots and the types and design features associated with grippers. 6. To introduce him to the various types of sensors used in robotics. 7. To make known to them the applications of robots in industries.
6	Course Outcomes	On successful completion of this course students will be able to CO1:Define a robot and classify different kinds of robots and configurations associated with a robot. CO2:Calculate the kinematic requirements for desired movements of a robot. CO3: Describe a SCARA, vision system for robot CO4:Describe and identify different kinds of sensors,end effectors and basic drives used in robots. CO5: Interpret the programming languages used in robots, the problems and limitations of various languages. CO6: Select a Robot for a given application in industry and define Micro-Robotics and MEMS.

7	Course Description	This course introduces students to Robotics and various applications of robots. They are taught about the anatomy, working and programming of a robot. They are introduced to various components in making a robot and their functions. The kinematics of motion of a robot and the analysis of various kinds of configurations is also done. Finally students learn about the multiple applications of a robot in the modern day industry.
8	Outline syllabus	
	Unit 1	**Introduction and Automated Flow Lines**
	A	Robot definition: Robotic systems - Its role in automated manufacturing; robot anatomy; History and development of industrial robots and manipulators.
	B	Basic structure of robots, Resolution, accuracy and repeatability.
	C	Classification, configuration of robots, arm, body and wrist motions.
	Unit 2	**Automated flow lines**
	A	Matrix representations of coordinate transformation, transformation about reference frame and moving frame.
	B	Forward & Inverse kinematics of 2-degree of freedom arm, specifying position & orientation of rigid bodies euler's angle and fixed rotation for specifying position & orientation
	C	D-H representation of kinematic linkages. Introduction to SCARA and its kinematics.
	Unit 3	**Robotic Grippers and sensors**
	A	Robot end-effectors, mechanical, magnetic and vacuum grippers.
	B	Sensors- Functioning, types, analysis and field of applications. Internal and external sensors, Position-potentiometric, optical sensors, encoders-absolute,incremental sensors, proximity sensors, velocity and acceleration sensors, force and torque sensors.
	C	Vision systems. Elements in a vision system,CCD camera, vidicon camera, Lighting techniques
	Unit 4	**Robot drives, control and basic programming**
	A	Drives used in robots- Hydraulic, pneumatic and electric drives. Comparison of drive systems and their relative merits and demerits.
	B	Introduction to basic mode of robot programming
	C	Requirements of robot programming languages, problems peculiar to robot programming languages.
	Unit 5	**Applications of Robots and futuristic topics**
	A	Handling, Loading and Unloading, Manufacturing cells, Welding, spray painting, Assembly and machining.
	B	Introduction to Micro-robotics and MEMS(Microelecto mechanical systems).
	C	Introduction to Fabrication technologies to Micro-robotics.

	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Koren, Y., “Robotics for Engineers”, McGraw Hill Book Co., 1985		
	Other References	1. Groover, M.P., Weiss, M., Nagel, R. N., Odrey, N. G., “Industrial Robotics (Technology, Programming and Applications)”, McGraw Hill, 1996. 1. Craig, J. J. “Introduction to Robotics”, Addision- wisely, 1989. 2. Matlab and Robostudio software package.		

School: SET		Batch : 2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MEC432
2	Course Title	Modern Vehicle Technology
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1 To enhance knowledge of Modern Vehicle technology by showing newly developed engines which includes Automotive gearbox, Brakes components, Fuel injection system. 2 This information use to understand modern vehicle design along with its significance in modern world. 3. To provide the knowledge of various type of injection system in motorbikes. 4. To provide the information about noise and pollution in vehicle with environmental contexts.
6	Course Outcomes	CO1: Describe the different forms of engines as Hybrid Vehicles, Magnetic track vehicles, which enhance power performance. CO2: Summarize about the Disc brakes, Self-energising disc brakes concepts using discs as the friction surfaces comparable with that of drum brakes CO3: Demonstrate the application of safety-cage, air-bags-crash resistance – passenger comfort and also reduction of noise and pollution. CO4: Explain about the Automatic gearboxes and transmissions helps to control complexity and weight by applying fluid coupling to replace clutch and use magnetic clutch. CO5: Distinguish about the different fuel injection system. CO6: Demonstrate the concept of latest vehicle technology.
7	Course Description	This course is designed to provide students with skills necessary to enter or advance in many automotive industry positions. The technology, diagnosis and repair of automotive electrical, mechanical and hydraulic systems are studied. Considerable time is spent developing hands-on skills that are used on the job. Skills learned in the program are valuable to individuals choosing to enter professions other than automotive technician, such as service writers, service managers, parts counter person, warranty clerks.

8	Outline syllabus			
	Unit 1	**Trends in Automotive Vehicle**		
	A	Hydrogen Engines-battery vehicles – Electric propulsion with cables		
	B	Hybrid Vehicles ,Magnetic track vehicles		
	C	Jaguar AJ6 Engine, Ford V-Six Range, Mercedes M112 V6 engines		
	Unit 2	**Brakes and Safety**		
	A	Regenerative braking, Disc Brakes, Self-energizing disc brakes		
	B	Brake linkages, Hydraulic Brake System, Dual Brake System.		
	C	Safety-cage, air-bags-crash resistance – passenger comfort.		
	Unit 3	**Automatic gearboxes and transmissions**		
	A	Hydraulic Gear Transmissions, Automatic transmission for commercial vehicles,		
	B	Alfa Romeo selespeed transmission, Van Doorne Trans missive System		
	C	Leyland variable transmission,		
	Unit 4	**Noise and Pollution**		
	A	Internal and external pollution control through alternate fuels		
	B	Power plants-Catalytic converters		
	C	Particle filters for particular emission.		
	Unit 5	**Fuel Injection systems**		
	A	SPFI, MPFI, DI, Pilot Injection, Unit Injection		
	B	CRDI; Two Wheeler Technology DTS- i, DTS – Fi, DTS – Si		
	C	Four Wheeler Technology: VVT, Camless Engine, GDi..		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Beranek. L.L. Noise Reduction, McGraw-Hill Book Co., Inc, Newyork, 1993		
	Other References	2. Garrat,S., “Motor Vehicles” , Butterworthy London,13th edition. 3. Bosch Hand Book, 3rd Edition, SAE,1993. 4 MSC Software from http://pages.mscsoftware.com/MSC_Symposium2012_Vehicle_Home.htm		

School: SET		Batch : 2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Automobile		Semester: V
1	Course Code	MEC315
2	Course Title	Mechanical Vibration
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	The course will enable the students to acquire theoretical and practical knowledge of vibrational systems and their application in day to day applications and in industry. One- and multi-degree-of-freedom systems. Natural frequencies and modes of vibrations, resonance, beat phenomenon, effect of damping, applications to practical problems, and methods to avoid excessive vibrations. Lagrange's equations.
6	Course Outcomes	On successful completion of this course students will be able to 1. Apply the concepts of vibrations and infer the importance in day to day life and industry 2. Compute the natural frequency of a undamped and damped system. 3. Compute natural frequency of single degree freedom system and be accustomed to various vibration measuring instruments 4. Compute natural frequency of Two degree freedom system. 5. Compute natural frequency of multi degree freedom system and critical speed of shafts.
7	Course Description	This course introduces fundamentals of vibration, free and forced, undamped and damped vibration, vibration of single Degree of Freedom (DoF) system, 2-DoF and multi-DoF systems, theory of vibration absorbers and vibration instruments. It is a Elective Course for UG students of Automobile Engineering and equivalent.
8	Outline syllabus	
	Unit 1	**INTRODUCTION**
	A	Periodic motion, harmonic motion, superposition of simple harmonic motions, beats,fourier analysis.
	B	Free vibration, Natural frequency, Equivalent Systems, Energy method for determining natural frequency, Torsional vibrations, Damped vibrations
	C	Damping models – Structural, Coulomb and Viscous damping, Vibrations of system with viscous damping, Logarithmic decrement, Viscous dampers
	Unit 2	**SINGLE DEGREE FREEDOM**

	A	Forced vibration, Harmonic Excitation with viscous damping, Steady state vibrations,		
	B	Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility,		
	C	Vibration measuring instruments- Displacement, Velocity, Acceleration and Frequency measuring instrument.		
	Unit 3	**TWO DEGREE FREEDOM SYSTEM:**		
	A	Introduction, Principal modes, Double pendulum, Torsional system with damping		
	B	Coupled System, Undamped dynamic, vibration absorbers		
	C	Centrifugal pendulum absorber, Dry friction damper, Untuned viscous damper		
	Unit 4	**MULTI DEGREE FREEDOM SYSTEM**		
	A	Exact Analysis Undamped free and forced vibrations of multidegree system, Influence numbers,		
	B	Reciprocal Theorem, Torsional vibration of multi rotor system, Principal coordinates,		
	C	Continuous systems- Longitudinal vibration of bars, Torsional vibrations of Circular shafts, Lateral vibration of beams.		
	Unit 5	**MULTI DEGREE FREEDOM SYSTEM: CRITICAL SPEED OF SHAFT**		
	A	Numerical Analysis Rayleigh's, Dunkerley's, Holzer's and Stodola's methods,		
	B	Shafts with one disc with and without damping, Multi-disc shafts		
	C	Rayleigh – Ritz method, Secondary critical speed.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Mechanical Vibrations –G. K. Grover – Jain Bros. Roorkee.		
	Other References	1. Mechanical Vibration – P. Srinivasan – TMH 2. Mechanical Vibration –V P Singh		

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechatronics		**Semester: V**
1	Course Code	MEC334
2	Course Title	CNC Technology
3	Credits	4
4	Contact Hours (L-T-P)	3-0-2
	Course Status	Compulsory
5	Course Objective	In this course, Student will be able to learn the necessity of the machining of the workpiece in advance CNC machine. Furthermore, They are able to apply the formula to analyze the gear system which is normally used in CNC machine and also learn the topics of dynamics of machines, fluid mechanics and machine design. They are able to learn the programming in CNC machine which is applied in industrial CNC machine. Eventually, they will be able to gain the knowledge on the latest technology of CNC machine tools.
6	Course Outcomes	The students will be able to: CO1: Demonstrate the introduction of CNC machine tools CO2: Summarize the structure of CNC machine tool. CO3: Explain the concept of controls of various motors and drives also. CO4: Apply the CNC programming in CNC machine for producing a product CO5: Explain the concepts of tooling and work holding
7	Course Description	This course prepares students to install, remove, maintain and repair this system in aCNC Machine. This course introduces students to Program the G and M Code, learn the drive of motor with particular CNC machine. It also discusses tool handling theory as well as the workpiece handling of a latest CNC machine tool system.
8	Outline syllabus	
	Unit 1	**INTRODUCTION TO CNC MACHINE TOOLS**
	A	Evolution of CNC Technology, Principles, Features, Advantages, Applications, CNC And DNC Concept,
	B	Classification Of CNC Machines – Turning Centre, Machining Centre, Grinding Machine, EDM
	C	Types Of Control Systems, CNC Controllers, Characteristics, Interpolators– Computer Aided Inspection
	Unit 2	**STRUCTURE OF CNC MACHINE TOOL**
	A	CNC Machine Building, Structural Details, Configuration and Design, Guide Ways – Friction, Anti Friction And Other Types Of Guide Ways,

	B	Elements Used To Convert The Rotary Motion To A Linear Motion – Screw And Nut, Recirculating Ball Screw, Planetary Roller Screw, Recirculating Roller Screw, Rack And Pinion, Spindle Assembly,		
	C	Torque Transmission Elements – Gears, Timing Belts, Flexible Couplings, Bearings.		
	Unit 3	**DRIVES AND CONTROLS**		
	A	Spindle Drives – DC Shunt Motor, 3 Phase AC Induction Motor, Feed Drives –Stepper Motor,		
	B	Servo Principle, DC And AC Servomotors, Open Loop And Closed Loop Control,		
	C	Axis Measuring System – Synchro-Resolver, Gratings, Moiré Fringe Gratings, Encoders, Inductosysn, Laser Interferometer.		
	Unit 4	**CNC PROGRAMMING**		
	A	Coordinate System, Structure Of A Part Program, G & M Codes, Tool Length Compensation, Cutter Radius And Tool Nose Radius Compensation,		
	B	Do Loops, Subroutines, Canned Cycles, Mirror Image, Parametric Programming, Machining Cycles,		
	C	Programming For Machining Centre And Turning Centre For Well Known Controllers Such As Fanuc, Heidenhain, Sinumerik Etc., Generation Of CNC Codes From CAM Packages.		
	Unit 5	**TOOLING AND WORK HOLDING**		
	A	Introduction To Cutting Tool Materials – Carbides, Ceramics, CBN, PCD–Inserts		
	B	Classification- PMK, NSH, Qualified, Semi Qualified And Preset Tooling, Tooling System		
	C	For Machining Centre And Turning Centre, Work Holding Devices For Rotating And Fixed Work Parts, Economics Of CNC, Maintenance Of CNC Machines.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. HMT, “Mechatronics”, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2005. 2. Warren S.Seamers, “Computer Numeric Control”, Fourth Edition, Thomson Delmar, 2002.		
	Other References	1. James Madison, “CNC Machining Hand Book”, Industrial Press Inc., 1996. 2. Ken Evans, John Polywka & Stanley Gabrel, “Programming Of CNC Machines”, Second Edition, Industrial Press Inc, New York, 2002 3. Peter Smid, “CNC Programming Hand Book”, Industrial Press Inc., 2000		

		4. Berry Leathan – Jones, “Introduction To Computer Numerical Control”, Pitman, London, 1987. 5. Radhakrishnan P, “Computer Numerical Control Machines”, New Central Book, Agency, 2002. 6. Rao P.N., “CAD/CAM”, Tata McGraw-Hill Publishing Company Limited, New Delhi,2002.

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch:		**Semester:**
1	Course Code	ECExxx
2	Course Title	Digital Electronics
3	Credits	4
4	Contact Hours (L-T-P)	3-0-2
	Course Status	
5	Course Objective	1.To acquire the basic knowledge of digital logic levels and application of knowledge to understand circuits. 2. To prepare students to perform the analysis and design of various digital electronic circuits.
6	Course Outcomes	After successful completion of this course the student will be able to: CO1: Design and analyse combinational logic circuits CO2: Design & analyse modular combinational circuits with MUX/DEMUX, Decoder, Encoder CO3: Design & analyse different flip flops and convert them. CO4: Design & analyse synchronous sequential logic circuits CO5: Use of programmable connections and FPGA implementation of different logic functions.
7	Course Description	This course covers combinational and sequential logic circuits. Topics include number systems, Boolean algebra, logic families, medium scale integration (MSI) and large scale integration (LSI) circuits, analog to digital (AD) and digital to analog (DA) conversion, and other related topics. Upon completion, students should be able to construct, analyse, verify, and troubleshoot digital circuits using appropriate techniques and test equipment.
8	Outline syllabus	
	Unit 1	**Digital System and Binary Codes**
	A	Digital Electronics Principles, Introduction to Number system and conversions, Binary codes (BCD, Gray code, excess 3 codes). Switching algebra, Boolean Functions.
	B	Canonical Forms: Minterms and Maxterms, Sum of Product (SOP), Product of Sum (POS), Conversion Between SOP and POS. Standard Forms.
	C	Digital Logic Gate. Karnaugh maps up to 4 variables. NAND and NOR Implementation of Boolean Functions.
	Unit 2	**Combinational Logic Design**
	A	Half and Full Adders, Subtractors, Magnitude Comparators

	B	Parity Generator-Even and Odd, Code converters		
	C	Multiplexers, De-multiplexers Encoder, Decoder.		
	Unit 3	**Introduction of Sequential Logic**		
	A	Introduction to Sequential Logic Circuits. Latches, Flip-Flops-S-R, J-K, D, T-their characteristics, excitation table and Timing diagram.		
	B	Time-Race in J-K Flip-Flop, Master-Slave flip-flop, Conversions of flip-flops.		
	C	Introduction to Mealy and Moore Machines.		
	Unit 4	**Synchronous Sequential Design**		
	A	Counters-Asynchronous and Synchronous, their designing with examples-Two-bit ripple counter using positive and negative edge triggered flip-flop.		
	B	Design of mod-n synchronous counter, Single mode-3bit mod-6 binary counter, Multimode 3bit mod-6 unit distance up &down counter, ring counter, Shift Registers. Universal and Bidirectional Shift Registers.		
	C	State Reduction and Assignment, Clocked Sequential Circuit Design Procedure.		
	Unit 5	**Memory Elements and Logic Families**		
	A	ROM, PROM, EEPROM		
	B	PLDs: PLA, PAL, CPLD, FPGA.		
	C	Different logic families: TTL, ECL, I2L. NMOS, PMOS, CMOS.		
	Lab expt 1	(a). Implementation of Gray to Binary converter using logic gates. (b). Implementation of Binary to Gray converter using logic gates.		
	Lab expt 2	Verification of De-Morgan's Theorem.		
	Lab expt 3	(a) To determine Boolean functions of logic gates (AND, OR and NOT). (b) To determine Boolean functions of Universal Gates.		
	Lab expt 4	(a). Design of Half Adder using logic gates and verify truth table. (b). Design of Full Adder using logic gates and verify truth table.		
	Lab expt 5	(a). Design of Half Subtractor using logic gates and verify truth table. (b). Design of Full Subtractor using logic gates and verify truth table.		
	Lab expt 6	Design and implementation of 4-bit binary Adder using IC 7483.		
	Lab expt 7	(a) To study the JK FF and verify truth-table. (b) To study the D FF and verify truth-table.		
	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	R.P. Jain, "Modern digital Electronics", Tata McGraw Hill, 4th edition, 2009.		
	Other References	1. Douglas Perry, "VHDL", Tata McGraw Hill, 4th edition, 2002. 2. W.H. Gothmann, "Digital Electronics- An introduction to theory and practice", PHI, 2nd edition, 2006.		

		3. D.V. Hall, “Digital Circuits and Systems”, Tata McGraw Hill, 1989 4. Charles Roth, “Digital System Design using VHDL”, Tata McGraw Hill 2nd edition 2012.

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: EEE		**Semester:** VI
1	Course Code	EEE330
2	Course Title	Control Systems
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	Control Systems is the study of the analysis and regulation of the output behaviors of dynamical systems subject to input signals. The concepts and tools discussed in this course can be used in a wide spectrum of engineering disciplines. The emphasis of this course will be on analysis and feedback controller design methods for linear time-invariant systems.
6	Course Outcomes	CO1:Apply transfer function models, signal flow graphs and block diagram algebra to obtain the transfer function of a given system CO2: Obtain system response in time domain CO3: Design a closed-loop control system to satisfy dynamic performance specifications using frequency response CO4:Analyze closed-loop control systems for stability and steady-state performance CO5: Design simple feedback controllers and compensators to meet desired performance specifications
7	Course Description	This course shall introduce the fundamentals of modeling and control of linear time invariant systems. The course will be useful for students from major streams of engineering to build foundations of time/frequency analysis of systems as well as the feedback control of such systems.
8	Outline syllabus	
	Unit 1	**Introduction to Control Problem**
	A	Feedback Control: open-loop and closed-loop systems, benefits of feedback, block diagram algebra
	B	Mathematical models of physical systems, signal flow graph
	C	Transfer function models of linear time-invariant systems
	Unit 2	**Time Response Analysis**
	A	Standard test signals, time response of first order systems for standard test inputs
	B	Time response of second order systems for standard test inputs

	C	Design specifications for second-order systems based on the time-response		
	Unit 3	**Frequency Response Analysis**		
	A	Introduction and frequency domain specifications		
	B	Correlation between frequency domain and time domain.		
	C	Polar plot and Bode plot		
	Unit 4	**Stability of Control Systems**		
	A	Concept of stability		
	B	Characteristic equation, location of roots in s plane for stability, Routh Hurwitz criterion.		
	C	Root-locus technique. Construction of root-loci		
	Unit 5	**Modern Control System**		
	A	Lag, lead, lag-lead compensator and their performance criteria		
	B	Concepts of state variables and state space model.		
	C	Solution of state equations, concept of controllability and observability.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.		
	Other References	1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International, 2009 2. B. C. Kuo, "Automatic Control System", Prentice Hall, 1995.		

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch:EEE		**Semester:**VI
1	Course Code	EEP321
2	Course Title	Control System Laboratory
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	1. An understanding of the methodology for modeling mechanical, electrical, and other types of dynamic systems using both time domain and frequency domain analysis. 2. An understanding of the fundamental analytical methods and tools used in control system design. 3. Ability to design feedback controllers and compensators to meet desired performance specifications.
6	Course Outcomes	CO1:Understand the modeling of linear-time-invariant systems using transfer function models, signal flow graphs and block diagram algebra CO2: Understandthe concept of stability and its assessment for linear-time invariant systems. CO3: To obtain system response in both time domain and frequency domain CO4:Analyze dynamic systems for their stability and performance CO5: To obtain and analyze the state space representation of a system
7	Course Description	This course shall introduce the fundamentals of modeling and control of linear time invariant systems. The course will be useful for students from major streams of engineering to build foundations of time/frequency analysis of systems as well as the feedback control of such systems.
8	Outline syllabus	
	Unit 1	**Practical based Feedback Systems**
		To determine the speed-torque characteristics of an AC Servomotor
		To study synchro transmitter and receiver pair and obtain output versus input characteristics
		To control the speed of an AC motor using TRIAC
	Unit 2	**Practical related to time response analysis**
		Time domain analysis and error analysis of first order control system using MATLAB
		Time domain analysis and error analysis of second order control system using MATLAB

	Unit 3	**Practical related to frequency response analysis**		
		Frequency domain analysis and error analysis of first order control system using MATLAB		
		Frequency domain analysis and error analysis of second order control system using MATLAB		
	Unit 4	**Practical related to Stability**		
		Stability analysis using Bode Plot of Linear Time Invariant system using MATLAB		
		Stability analysis using Root Locus Technique of Linear Time Invariant system using MATLAB		
	Unit 5	**Practical related to State Space Analysis**		
		To obtain state space representation of a given system using MATLAB.		
		To transform a given state space model to transfer function and vice versa using MATLAB		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997		
	Other References	1. K. Ogata, "Modern Control Engineering", Prentice Hall, 1991.		

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MEP398
2	Course Title	Automation Laboratory
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	To understand the basic concepts of automation and robotics and different indu PLC, CNC and Robot. The purpose of this laboratory is to train the students to software and hardware of PLC so that they can gain enough experiences to mee automation era.
6	Course Outcomes	Students will able to CO1- Analyze the surface roughness using specific equipment CO2 - Study and analyze the CNC programming for different kind of machining and operation CO3 - Analyze the performance of Pick and Place robot by Teach Pendant Method CO4 –Demonstrate and Analyze different PLC application CO 5 - Study and analyze the controller of DC motor. CO6- Describe the working principles of various types of transducers and image processing techniques.
7	Course Description	The objective of this laboratory enables the students to build a firm background in PLC hardware as well as software. Students learn about ladder logic programming, wiring different I/O's (analog and digital) with PLC programming. They acquire the practical skills sufficient to design and realize basic automation process.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	Measurements of Surface roughness, Using Tally Surf / Mechanical Comparator
	Experiment 2	Develop the CNC program for grooving, drilling and boring a job of given dimension according to the specified dimensions using CNC Lathe.
	Experiment 3	Pick and place operation of Robot in Teach Pendent method
	Experiment 4	PLC Application Trainer

	Experiment 5	PLC Controlled Material Handling System		
	Experiment 6	Speed control of DC motor.		
	Experiment 7	Study of various types of transducers.		
	Experiment 8	Study of image processing technique.		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	Book by A. K. Gupta, Jean Riescher Westcott, and Satish Kumar Arora		
	Reference	Manuals provided in the lab		

School: SET		Batch : 2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MEC337
2	Course Title	Applied Hydraulics and Pneumatics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	The objective of this course is to impart knowledge on principles and operations of fluid power devices used in the design of hydraulic and pneumatic circuits.
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1: Recall various fluid properties and identify the appropriate fluid power system for particular application. CO2:Recognize the suitable pump and actuators for particular application CO3: Understand the components in hydraulic circuit design and use them in hydraulic circuit development. CO4: Apply the knowledge of pneumatic components for hydraulic circuit design. CO5: Design and interpret hydraulic and pneumatic circuits related to industrial applications.
7	Course Description	This course introduces students to deal with the hydraulic and pneumatic principles and understand the importance of components and equipment. This course expands on the mechanical engineering student's to identify, analyze, describe and design the basic circuits of hydraulic / pneumatic systems. This course is intended to deal with theprinciple, working of fluid power actuators to enable students to understand the control components, various flow control valves and types of accumulators.
8	Outline syllabus	
	Unit 1	Fluid Power Systems and Fundamentals
	A	Introduction to fluid power, Advantages of fluid power, Application of fluid power system. Types of fluid power systems, Basics of Hydraulics, Applications of Pascal's Law.
	B	Seals, sealing materials, compatibility of seal with fluids. Types of pipes,hoses, and quick acting couplings. Fluid conditioning through filters,strainers; sources of contamination and contamination control; heat exchangers.
	C	Laminar and Turbulent flow (Reynold's number); Darcy's equation, losses

		in pipe, valves and fittings.
	Unit 2	**Pumps and Actuators**
	A	Pumps: Classification, Pumping theory of positive displacement pumps, construction and working of Gear pumps, Vane pumps, Piston pumps, fixed and variable displacement pumps, Pump performance characteristics, pump selection factors, problems on pumps.
	B	Actuators: Classification cylinder and hydraulic motors, Hydraulic cylinders, single and double acting cylinder, mounting arrangements, cushioning, special types of cylinders.
	C	Construction and working of rotary actuators such as gear, vane, piston motors, and Hydraulic Motor. Theoretical torque, power, flow rate, and hydraulic motor performance; numerical problems. Symbolic representation of hydraulic actuators (cylinders and motors).
	Unit 3	**Components in hydraulic circuit design**
	A	**Components:** Classification of control valves, Directional Control Valves- symbolic representation, constructional features of poppet, sliding spool, rotary type valves solenoid and pilot operated DCV, shuttle valve, and check valves.
	B	Pressure control valves - types, direct operated types and pilot operated types. Flow Control Valves -compensated and non-compensated FCV, needle valve, temperature compensated, pressure compensated, pressure and temperature compensated FCV, symbolic representation.
	C	Accumulators: Types, selection/ design procedure, applications of accumulators. Types of Intensifiers, Pressure switches /sensor, Temperature switches/sensor, Level sensor.
	Unit 4	**Pneumatic Systems and Components**
	A	**Introduction to Pneumatic systems:** Pneumatic power system, advantages, limitations, applications, Choice of working medium. Characteristics of compressed air and air compressors. Structure of pneumatic control System, fluid conditioners-dryers and FRL unit.
	B	**Pneumatic Actuators:** Linear cylinder – types of cylinders, working, end position cushioning, seals, mounting arrangements, and applications. Rotary cylinders- types, construction and application, symbols.
	C	**Pneumatic Control Valves:** DCV such as poppet, spool. Types and construction of Pressure control valves, flow control valves. Construction and working of quick exhaust valve, time delay valve, shuttle valve and symbols.
	Unit 5	**Design of Pneumatic Circuits**
	A	**Simple Pneumatic Control:** Direct and indirect actuation pneumatic cylinders, speed control of cylinders - supply air throttling and exhaust air throttling.
	B	**Signal Processing Elements:** Use of Logic gates - OR and AND gates in

		pneumatic applications. Practical examples involving the use of logic gates.		
	C	**Multi- Cylinder Application:** Coordinated and sequential motion control. Cascading method- principle, Practical application examples (up to two cylinders) using cascading method (using reversing valves).		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	2. Esposito, A. , "Fluid Power with Applications", Pearson Education, 2005		
	Other References	4. Srinivasan.R, "Hydraulic and Pneumatic controls", Tata McGraw - Hill Education (2008) 5. Majumdar,S.R., "Oil Hydraulics Systems- Principles and Maintenance",Tata McGraw-Hill, 2001 6. Download FluidSIM Software for Circuit Simulation "http://fluidsim.com"		

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	**MEP337**
2	Course Title	Applied Hydraulics and Pneumatics Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	The objective of this course is to impart knowledge on principles and operations of fluid power devices used in the design of hydraulic and pneumatic circuits.
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1:Recall various fluid properties and identify the appropriate fluid power system for particular application. CO2:Recognize the suitable pump and actuators for particular application CO3: Understand thecomponents in hydraulic circuit design and use them in hydraulic circuit development. CO4: Apply the knowledge of pneumatic components for hydraulic circuit design. CO5: Design and interpret hydraulic and pneumatic circuits related to industrial applications.
7	Course Description	This course introduces students to deal with the hydraulic and pneumatic principles and understand the importance of components and equipment. This course expands on the mechanical engineering student's to identify, analyze, describe and design the basic circuits of hydraulic / pneumatic systems. This course is intended to deal with theprinciple, working of fluid power actuators to enable students to understand the control components, various flow control valves and types of accumulators.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	To demonstrate the motion of a single acting cylinder and double acting cylinder.
	Experiment 2	To demonstrate the use of memory valve and quick exhaust valve with double acting cylinder.
	Experiment 3	To demonstrate the use of dual pressure valve and shuttle valve with single acting cylinder.
	Experiment 4	To perform AND & OR logic for forward stroke of a double acting

		cylinder using two manual control.		
	Experiment 5	To control the speed of a double acting cylinder using metering in and metering out flow control valve (Speed controlling operation).		
	Experiment 6	To perform single and multicycle operation of a double acting cylinder using roller lever valve and memory valve.		
	Experiment 7	To perform continuous operation of a double acting cylinder using double solenoid valve.		
	Experiment 8	To operate two double acting cylinders electro pneumatically (Sequence of operation: A+B+A-B-).		
	Experiment 9	To demonstrate the use of an inductive sensor with double acting cylinder and double solenoid valve.		
	Experiment 10	To demonstrate the auto reset of a counter after the operation of a double acting cylinder after 'n' cycles using double solenoid valve		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	4.		

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering with Spec. in Mechatronics		**Semester: VI**
1	Course Code	MEC309
2	Course Title	Design of Mechatronics System
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	• Mechatronics system design and simulation, ergonomics and safety • Theoretical and practical aspects of computer interfacing, real time data acquisition and control • Design of motion control, motion converter and temperature control.
6	Course Outcomes	On successful completion of this course, students will be able to CO1: Understand the basics and key elements of mechatronics design process CO2:Familiar with basic system modelling CO3: Understand the concepts of engineering system and dynamic response of the system CO4: Realize the concepts of real time interfacing and data acquisition CO5: Understanding the concepts of design of mechatronics system through case studies. CO6: Design and control a simple mechatronic system.
7	Course Description	This course intends to impart through knowledge in system modelling, system identification and simulation of mechatronics system and to provide their applications in real-life.
8	Outline syllabus	
	Unit 1	**Introduction to design of mechatronics system**
	A	Key elements, Mechatronics design process, Design parameters
	B	Mechatronics and traditional design, Advanced approaches in mechatronics design, Ergonomics and safety
	C	Introduction to industrial design, modelling, simulation and analysis
	Unit 2	**Basic system modelling**
	A	Introduction, Model categories, Model development
	B	Simulation using software, Verification and validation

	C	Mathematical modelling : Basic system modelling of mechanical, electrical, fluid and thermal system		
	Unit 3	**Mechatronic system modelling**		
	A	Engineering systems: Rotational-translational and electro-mechanical system		
	B	Engineering systems:Pneumatic-mechanical, hydraulic-mechanical, micro-electro mechanical system.		
	C	Dynamic responses of system: First order, second order system – Performance measures		
	Unit 4	**Real time interfacing**		
	A	Introduction – Selection of interfacing standards, elements of data acquisition and control systems		
	B	Overview of I/O process, General purpose I/O cards and its installation		
	C	Data conversion process, Application software, Man machine interface		
	Unit 5	**Case studies on design of mechatronics system**		
	A	Motion control using DC Motor, AC Motor and Servomotor		
	B	Temperature control of hot/cold reservoir, Pick and place robot, Car parking barriers		
	C	Motion and temperature control of washing machine, Auto focus camera, exposure control.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Devdas Shetty, Richard A. Kolk, “Mechatronics System Design”, 2nd Edition, Cengage Learning 2011		
	Other References	1 Georg pelz, "Mechatronic Systems: Modeling and simulation" with HDL’s, John wiley and sons Ltd, 2003. 2. Bradley, D.Dawson, N.C. Burd and A.J. Loader, "Mechatronics: Electronics in Products and Processes", CRC Press 1991 , First Indian print 2010 3. De Silva, "Mechatronics: A Foundation Course", Taylor & Francis, Indian Reprint, 2013.		

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering with Spec. in Mechatronics		**Semester: V**
1	Course Code	MEP309
2	Course Title	Design of Mechatronics System Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Program Elective
5	Course Objective	This course intends to provide an understanding of Mechatronics System Design and their applications in real-life as well as in industries. The Lab build upon the concepts learned in the course 'Design of Mechatronics System'.The Lab also provides an opportunity to design and build sensor-based control systems as part of projects.
6	Course Outcomes	On successful completion of this course, students will be able to CO1: Define a Mechatronics System Design and state its purpose. CO2: Perform practical tasks using different types of controllers CO3: System to collect data from analog and digital devices CO4: System to control and drive different types of actuators. CO5: Build and test simple sensor-based control systems.
7	Course Description	This course intends to provide an understanding of Mechatronics System Design and their applications in real-life as well as in industries. The Lab build upon the concepts learned in the course 'Design of Mechatronics System'. The Lab also provides an opportunity to design and build sensor-based control systems as part of projects.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	Principles of switching
	Experiment 2	Stepper motor control
	Experiment 3	DC-motor speed control
	Experiment 4	Temperature control system
	Experiment 5	Motor selection for mechatronic system
	List of Projects	
	Project 1	Concept Design and User Requirements

	Project 2	Actuator Selection and Mechanical Design.		
	Project 3	Feedback Devices and Flowchart		
	Project 4	Controller Selection and Simulation		
	Project submission	Final Report and Presentation		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	Devdas Shetty, Richard A. Kolk, “Mechatronics System Design”, 2nd Edition, Cengage Learning 2011		
	Software	MATLAB		

School: SET		Batch : 2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MEC440
2	Course Title	Modelling & Simulation
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Department Elective
5	Course Objective	After the successful completion of the course, the students will be able to: 1. Describe the role of important elements of discrete event simulation and modeling paradigm 2. Conceptualize real world situations related to systems development decisions, originating from source requirements and goals. 3. Develop skills to apply simulation software to construct and execute goal-driven system models. 4. Interpret the model and apply the results to resolve critical issues in a real world environment.
6	Course Outcomes	CO1: Apply & Understand various simulation systems & Techniques CO2: Understand General Principles of Simulation modelling techniques CO3: Understand various properties related to simulation techniques CO4: Analyse the simulation data CO5: Apply and Understand various types of modeling and simulation techniques CO6: Perform output analysis with the help of softwares.
7	Course Description	The objective of this course is to make the students realize about the various concepts of industrial modeling and simulation in an modern manufacturing industry. After learning this course the student will be able to implement all these techniques in an industry to help his as well as the industries growth in the market.
8	Outline syllabus	
	Unit 1	**Introduction to Simulation**
	A	Simulation, Advantages, Disadvantages, Areas of application, System environment.
	B	Components of a system, Model of a system, types of models, steps in a simulation study.
	C	Simulation of Queuing systems, Simulation of Inventory System, Other simulation examples.
	Unit 2	**General Principles and Random Numbers**

	A	Concepts in discrete - event simulation, event scheduling/ Time advance algorithm, simulation using event scheduling.		
	B	Properties, Generations methods		
	C	Tests for Random number- Frequency test, Runs test, Autocorrelation test.		
	Unit 3	**Random Variate Generation & Optimization Via Simulation**		
	A	Inverse Transform Technique- Exponential, Uniform, Weibull, Triangular distributions		
	B	Direct transformation for Normal and log normal Distributions, convolution methods- Erlang distribution, Acceptance Rejection Technique		
	C	Meaning of Optimization via simulation, difficulty, Robust Heuristics, Random Search.		
	Unit 4	**Analysis of Simulation Data**		
	A	Data collection, Identification and distribution with data, parameter estimation, Goodness of fit tests		
	B	Selection of input models without data, Multivariate and time series analysis.		
	C	Model Building, Verification, Calibration and Validation of Models.		
	Unit 5	**Output Analysis – Types of Simulations with Respect to Output Analysis**		
	A	Stochastic Nature of output data, Measures of Performance and their estimation		
	B	Output analysis of terminating simulation, Output analysis of steady state simulations.		
	C	Selection of Simulation Software, Simulation packages, Trend in Simulation Software.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	2. Jerry Banks, John S Carson, II, Berry L Nelson, David M Nicol, Discrete Event system Simulation, Pearson Education, Asia, 4th Edition, 2007, ISBN: 81-203-2832-9.		
	Other References	6. Geoffrey Gordon, System Simulation, Prentice Hall publication, 2nd Edition, 1978, ISBN: 81-203-0140-4. 7. Averill M Law, W David Kelton, Simulation Modelling & Analysis, McGraw Hill International Editions – Industrial Engineering series, 4th Edition, ISBN: 0-07-100803-9. 8. Narsingh Deo, Systems Simulation with Digital Computer, PHI Publication (EEE), 3rd Edition, 2004, ISBN: 0-87692-028-8.		

School: SET		Batch : 2019-2023
Program: B.Tech		Current Academic Year: 2019-2020
Branch: ME		Semester: VIII
1	Course Code	MEC439
2	Course Title	Robotics and Machine Vision System
3	Credits	4
4	Contact Hours (L-T-P)	3-0-2
	Course Status	Compulsory
5	Course Objective	In this course, Student will be able to learn the necessity of basic kinds of robots, the transmission systems used to drive robots and the sensors used in robots. Furthermore, They can apply programming which is used to control the controller of robotand also formulate as well as solve typical problems based on kinematics link of robotic system. Eventually, they will be able to gain the knowledge on future trends of robot which is normally used in industries.
6	Course Outcomes	The students will be able to: CO1: Demonstrate the history and development of industrial robots and manipulators and also classify the robot motions. CO2: Summarize the concept of robot end effectors and the types of sensors CO3: Explain the concept of mechanism and dynamic control of robot. CO4: Classify the fundamentals of machine vision and rudiments of various techniques used in robot. CO5: Demonstrate the programming which is used to control the controller of robot.
7	Course Description	This course prepares students to install, remove, maintain and repair this system in aRobotic system. This course introduces students to learn about actuators and sensors. It also discusses programming as well as the maintenance of a controller of robotic system.
8	Outline syllabus	
	Unit 1	**BASICS OF ROBOTICS**
	A	Robot definition: Robotic systems - Its role in automated manufacturing; robot anatomy; History and development of industrial robots and manipulators.
	B	Basic structure of robots, Resolution, accuracy and repeatability.Basic components of robot-Laws of robotics
	C	Classification, configuration of robots, arm, body and wrist motions.
	Unit 2	**ROBOT END EFFECTORS AND SENSORS**
	A	Robot end-effectors, mechanical, magnetic and vacuum grippers.

	B	Sensors- Functioning, types, analysis and field of applications. Internal and external sensors, Position-potentiometric,		
	C	Optical sensors, encoders-absolute, incremental sensors, proximity sensors, velocity and acceleration sensors, force and torque sensors.		
	Unit 3	**ROBOT MECHANICS**		
	A	Robot kinematics: Introduction- Matrix representation- rigid motion & homogeneous transformation-		
	B	Forward & Inverse kinematics examples of 2R, 3R and 3P manipulators, specifying position & orientation of rigid bodies euler's angle and fixed rotation for specifying position & orientation		
	C	Robot Dynamics: Introduction - Manipulator dynamics – Lagrange - Euler formulation- Newton - Euler formulation		
	Unit 4	**MACHINE VISION FUNDAMENTALS**		
	A	Machine vision: image acquisition, digital images-sampling and quantization-levels of computation		
	B	Feature extraction-windowing technique- segmentation- Thresholding		
	C	Edge detection- binary morphology - grey morphology		
	Unit 5	**ROBOT PROGRAMMING**		
	A	Robot programming: Robot Languages- Classification of robot language- Computer control		
	B	robot software-Val system and Languages		
	C	Application and future of robots		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	3. M.P.Groover, Industrial robotics- Technology, programming and Applications, McGraw-Hill, 1986 4. Koren, Y., "Robotics for Engineers", McGraw Hill Book Co., 1985 5. Deb. S. R., "Robotics Technologies and Flexible Automation", Tata McGraw Hill Co. 1994		
	Other References	1. Sathya Ranjan Deb, robotics Technology & flexible Automation Sixth edition, Tata Mcgraw-Hill Publication, 2003. 2. Gorden M.Dair, Industrial Robotics, PHI 1988. 3. K.S.Fu, R.C.Gonzalez, C.S.G.Lee, Robotics: Sensing, Vision& Intelligence, Tata Mcgraw-Hill Publication, 1987. 4. John.J.Craig, Introduction to Robotics: Mechanics & control, Second edition-2002		

School: SET		**Batch:2018-2022**
Program: B.Tech		**Current Academic Year: 2018-2019**
Branch: ECE/ME		**Semester:**
1	Course Code	ECE272
2	Course Title	Sensors and Signal Processing
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Elective
5	Course Objective	1. To impart knowledge of units and standards of measurement. 2. To understand the sensors and signal processing used mechatronics.
6	Course Outcomes	CO1: Define actuator and impart knowledge on open loop and closed loop system CO2: Knowledge of various units and standards used in measurement system CO3: Understand types of resistive, inductive and capacitive transducers CO4: Knowledge of smart and intelligent actuators CO5: Explain amplification, filtering , signal conditioning and data logging
7	Course Description	This is a course on sensors and signal processing used for mechatronics engineer.
8		
	Unit 1	**INTRODUCTION**
	A	Definitions: Mechatronics & actuator; current & voltage sources
	B	Grounding; Solenoids, relays, electrical motors for actuators ;
	C	Basics of open loop and closed loop systems , block diagram of mechatronics system
	Unit 2	**SCIENCE OF MEASUREMENT**
	A	Units and Standards, Calibration techniques , Errors in Measurements
	B	GeneralizedMeasurement System
	C	Transducer, Response of transducers to different timevarying inputs, Classification of transducers
	Unit 3	**ELECTRICAL MEASUREMENTS**
	A	Resistive transducers: Potentiometer, RTD , Thermistor, Thermocouple, Strain gauges use in displacement, temperature, force measurement
	B	Inductive transducer: LVDT ,RVDT use in displacement
	C	Capacitive transducer :Piezo electric transducer, Digital displacement transducers
	Unit 4	**SMART AND INTELLIGENT SENSORS**
	A	Definitions: Smart and intelligent sensor

	B	Architecture and operation of smart sensor		
	C	intelligent actuator without feedback sensor and intelligent actuator with feedback sensor		
	Unit 5	**SIGNAL CONDITIONING AND DATA ACQUISITION**		
	A	Amplification, Filtering		
	B	Sample and Hold circuits, Data Acquisition: Single channel and multi-channel data acquisition		
	C	Data logging		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. E. O. Doebelin, 'Measurement Systems – Applications and Design ', Tata McGraw Hill, edition 1992. 2. A. K. Sawhney, ' A course in Electrical and Electronic Measurement and Instrumentation', Dhanpat Rai and Co (P) Ltd, 2004.		
	Other References	1.Beckwith, Marangoni and Lienhard, 'Mechanical Measurements', Addison – Wesley,5th Edition, 2000. 2. D. Roy Choudry, Sheil Jain, ' Linear Integrated Circuits', New Age International Pvt.Ltd., 2000. 3. Patranabis. D, "Sensors and Transducers", 2nd edition PHI, New Delhi, 2003.		

School: SET		**Batch : 2019-2023**
Program: B.Tech		**Current Academic Year: 2019-2020**
Branch: ME/CE		**Semester: II**
1	Course Code	PHY120
2	Course Title	Engineering Physics
3	Credits	3
4	Contact Hours (L-T-P)	2-1-0
	Course Status	Compulsory
5	Course Objective	1. To know about the Elasticity, Stress- Strain Diagram and Bending of beam 2. To explain the concepts of Transverse and Longitudinal Waves, interference, stretched string and standing waves and resonance. 3. To get introduced about the zeroth and first laws thermodynamics, General Relation between Cp and Cv and Work Done during Isothermal and Adiabatic Processes. 4. To analyse the Second law of thermodynamics, Carnot Cycle, Kelvin-Planck and Clausius Statements and their Equivalence.
6	Course Outcomes	CO1: Learn the Elastic moduli, Relation between elastic constants, Poisson's Ratio and Bending of beam CO2: Understand the importance interference, standing waves and resonance CO3: Able to explain the Zeroth and first laws of Thermodynamics CO4: Figure out the Applications of First Law; General Relation between Cp and Cv; Work Done during Isothermal and Adiabatic Processes CO5: Studied Second Law of Thermodynamics; Concept of Entropy. CO6: Analyse the concepts of Elasticity, Waves and different laws of Thermodynamics
7	Course Description	This course is about describing the different Elastic constants, concepts of waves, Zeroth, first and second laws of Thermodynamics
8	Outline syllabus	
	Unit 1	**Elasticity**
	A	Hooke's Law, Stress- Strain Diagram, Elastic moduli, Relation between elastic constants, Poisson's Ratio, Determination of Poisson’s ratio
	B	Energy stored per unit volume in a strain; Bending of beam
	C	Bending moment, Cantilever
	Unit 2	**Waves-I**
	A	Transverse and Longitudinal Waves,
	B	speed of a travelling wave
	C	wave speed on a stretched string, energy and power

	Unit 3	**Waves-II**		
	A	wave equation,		
	B	interference,		
	C	Standing waves and resonance.		
	Unit 4	**Zeroth and first law of thermodynamics**		
	A	Thermodynamic Equilibrium; Zeroth Law of Thermodynamics and Concept of Temperature; Work and Heat Energy		
	B	First Law of Thermodynamics; Applications of First Law; General Relation between Cp and Cv		
	C	Work Done during Isothermal and Adiabatic Processes		
	Unit 5	**Second law of thermodynamics**		
	A	Limitations of first law of thermodynamics, Reversible and Irreversible Processes; Carnot Cycle		
	B	Kelvin-Planck and Clausius Statements and their Equivalence		
	C	Second Law of Thermodynamics; Concept of Entropy.		
	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Principles of physics, J. Walker, D. Halliday and R. Resnick, Wiley India pvt. Ltd. 2. Heat and Thermodynamics, Brijlal and N. Subramanyan, S.Chand and Sons.		
	Other References	1. The Feyman Lectures on Physics, volume 1.		

School: SET		Batch: 2019-2023	
Program: B.Tech.		Current Academic Year: 2019-2020	
1	Course Code	HMM111	
2	Course Name	Human values and Ethics	
3	Credits	2	
4	Contact Hours (L-T-P)C	(2-0-0)2	
5	Course Objective	To facilitate the development of a Holistic perspective among students towards life and profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of Existence	
6	Course Outcomes	On a successful completion of this course students will be able to CO1. Apply the importance of human values and ethics in technical education CO2. Examine the importance of 'I' and 'Body'. CO3. Infer the importance of harmony in the self, family and the society for mutual fulfilment. CO4. Infer the importance of harmony among human beings, other living beings and entire nature for universal equilibrium and mutual co-existence. CO5. Apply the ethical approach in profession for continuous happiness and sustained prosperity. CO6. Infer the importance of values and ethics in corporate sector	
7	Outline of syllabus:		
7.01	HMM111.A	Unit 1	The Need and Process for Value Education
7.02	HMM111.A1	Unit 1 Topic 1	The need, basic guidelines, content and process for Value Education
7.03	HMM111.A2	Unit 1 Topic 2	Concept of 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration; Continuous Happiness and Prosperity- A look at basic Human Aspirations
7.04	HMM111.A3	Unit 1 Topic 3	Right understanding, Relationship and Physical Facilities- the basic requirements for fulfilment of aspirations of every human being with their correct priority
7.05	HMM111.B	Unit 2	Understanding Harmony in the Human Being - Harmony in Myself
7.06	HMM111.B1	Unit 2 Topic 1	Human being as a co-existence of the sentient 'I' and the material 'Body'
7.07	HMM111.B2	Unit 2 Topic 2	The needs of Self ('I') and 'Body' ; Understanding the Body as an instrument of 'I' (I being the doer, seer and

			enjoyer)
7.08	HMM111.B3	Unit 2 Topic 3	The characteristics and activities of 'I' and harmony in 'I' ; Understanding the harmony of I with the Body: Correct appraisal of Physical needs, meaning of Prosperity in detail
7.09	HMM111.C	Unit 3	Harmony in the Family and Society
7.10	HMM111.C1	Unit 3 Topic 1	Values in human-human relationship; Trust and Respect as the foundational values of relationship
7.11	HMM111.C2	Unit 3 Topic 2	Understanding the meaning of Trust; Difference between intention and competence; The meaning of Respect; Difference between respect and differentiation; the other salient values in relationship
7.12	HMM111.C3	Unit 3 Topic 3	Harmony in the society (society being an extension of family; Visualizing a universal harmonious order in society - from family to world family
7.13	HMM111.D	Unit 4	Harmony in the Nature and Existence
7.14	HMM111.D1	Unit 4 Topic 1	The harmony in the Nature
7.15	HMM111.D2	Unit 4 Topic 2	Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature
7.16	HMM111.D3	Unit 4 Topic 3	Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
7.17	HMM111.E	Unit 5	Competence in professional ethics
7.18	HMM111.E1	Unit 5 Topic 1	Ability to utilize the professional competence for augmenting universal human order
7.19	HMM111.E2	Unit 5 Topic 2	Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
7.20	HMM111.E3	Unit 5 Topic 3	Ability to identify and develop appropriate technologies and management patterns for above production systems.
8	Course Evaluation		
8.1	Course work: 30 marks		
8.11	Attendance	None	
8.12	Homework	4 assignments, no weight	
8.13	Quizzes/Class Tests	Two	
8.14	Projects	None	
8.15	Presentations	None	
8.16	Any other	None	
8.2	MTE	one, 20 marks	
8.3	End-term examination: 50 marks		
9.1	Text books	1. R.R Gaur, R Sangal, G P Bagaria, "A foundation course in Human	

		Values and professional Ethics", Excel books, New Delhi
9.2	Other references	1. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. 2. A.N. Tripathy, 2003, Human Values, New Age International Publishers. 3. PL Dhar, RR Gaur, Science and Humanism, Commonwealth Purblishers.

School: SET		Batch: 2019-2023
Program: B.Tech.		Current Academic Year: 2019-2020
Branch: ME		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: demonstrate the algorithm, Pseudo-code and flow chart for the given problem. CO2: develop better understanding of basic concepts of C programming. CO3: create and implement logic using array and function. CO4: construct and implement the logic based on the concept of strings and pointers. CO5: apply user-defined data types and I/O operations in file. CO6: design and develop solutions to real world problems using C.
7	Course Description	Programming for problem solving gives the Understanding of C programming and implement code from flowchart or algorithm
8	Outline syllabus	
	Unit 1	**Logic Building**
		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**
		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**		
		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**		
		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**		
		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	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

School: SET		Batch: 2019-2023
Program: B.Tech.		Current Academic Year: 2019-2020
Branch: All		Semester: I
1	Course Code	EVS103
2	Course Title	Environmental Science
3	Credits	03
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	CO1. Interpret the scope of environmental science with knowledge about various types of natural resources and its conservation CO2. Analyse the structure and composition of atmosphere and factors affecting weather and climate CO3.Study about pollution causes, effects and control and solid waste management CO4. Analyse the effect of global warming and ozone layer depletion CO5. Interpret the importance of study of sustainable development, resettlement and rehabilitation, impact of population explosion on environment CO6.Examine the overall aspects of environment, its issues and its management
6	Course Outcomes	CO1.Understand the principles and scope of environmental science CO2.Knowledge about various types of natural resources and its conservation CO3.Study about the structure and composition of atmosphere and factors affecting weather and climate CO4.Study about pollution causes, effects and control and solid waste management and various policies to curb pollution problem CO5.About ecosystem and biodiversity and various strategies for biodiversity conservation. CO6.Overall understanding of the concepts of various elements of environment and related phenomenon.
7	Course Description	Environmental Science emphasises on various factors as 1. Importance and scope of environmental science 2. Natural resource conservation 3. Pollution causes, effects and control methods and solid waste management 4. Social issues associated with environment
8	Outline syllabus	

	Unit 1	**General Introduction**		
	A	Definition, principles and scope of environmental science		
	B	Water Resources, Land Resources, Food Resources		
	C	Mineral Resources, Energy Resources, Forest Resources		
	Unit 2	**Atmosphere and meteorological parameters**		
	A	Structure and composition of atmosphere		
	B	Meteorological parameters: Pressure, Temperature, Precipitation, Humidity,		
	C	Radiation, Wind speed and direction, Wind Rose		
	Unit 3	**Environmental Pollution (Cause, effects and control measures) and climate change**		
	A	Air, water, Noise and Soil pollution and Case studies		
	B	Solid waste management: Causes, effects and control measures of urban and industrial wastes.		
	C	Concept of Global Warming, green house effect, ozone layer depletion, Kyoto, IPCC concerns		
	Unit 4	**Ecosystem and Biodiversity conservation**		
	A	Structure and Function of ecosystem, Energy flow in ecosystem, food chain, food web, and ecological succession		
	B	Hot spots, Endangered and endemic species of India, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions		
	C	Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity. Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.		
	Unit 5	**Social Issues and the Environment**		
	A	Concept of sustainable development, Water conservation		
	B	Resettlement and rehabilitation of people; its problems and concerns, Case studies		
	C	Population explosion and its consequences		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	**1.** Joseph, Benny, "Environmental Studies", Tata Mcgraw-Hill. **2.** .Howard S. Peavy, Donald R. Rowe, George Tchobanoglous. Environmental engineering Mc Graw-Hill, 1985		
	Other References			

<table>
<tr><td colspan="2">School: SET</td><td>Batch: 2019-2023</td></tr>
<tr><td colspan="2">Program: B.Tech.</td><td>Current Academic Year: 2019-2020</td></tr>
<tr><td>1</td><td>Course code</td><td>ECC301</td></tr>
<tr><td>2</td><td>Course Title</td><td>Community Connect</td></tr>
<tr><td>3</td><td>Credits</td><td>2</td></tr>
<tr><td>3.01</td><td>(L-T-P)</td><td>(0-0-2)</td></tr>
<tr><td>4</td><td>Learning Hours</td><td><table><tr><td>Contact Hours</td><td>60</td></tr><tr><td>Project/Field Work</td><td>40</td></tr><tr><td>Assessment</td><td>00</td></tr><tr><td>Guided Study</td><td>20</td></tr><tr><td>Total hours</td><td>60</td></tr></table></td></tr>
<tr><td>5</td><td>Course Objectives</td><td>1. To connect the students to the community.
2. To conduct survey of community people and record responses and identify the issues faced by the community.
3. To do detailed analysis of data collected in the survey and student will use their learning to propose suitable solution for these issues.
4. To enhance skills of students on communication, data analysis and report writing skills.
5.To conduct survey on general awareness.</td></tr>
<tr><td>6</td><td>Course Outcomes</td><td>CO1. Interpret knowledge on different issues faced by the community in better way.
CO2. Analyze data and identify problems
CO3. Solve the complex problems efficiently
CO4. Construct documentation, data analysis and report on any project.
CO5. Estimate the engineering and societal values of the developed solution for the problem
CO6. Utilize technology-based knowledge to improvise the existing solution for the problem</td></tr>
<tr><td>7</td><td>Theme</td><td>Major Sub-themes for research:
1. Energy solutions, saving and management
2. Electronics solution in everyday life
3. Civil works like transportation, drainage, water, construction etc.
4. Agriculture and irrigation, crop production
5. IoT and smart solutions
6. Medical and Healthcare issues
7. Environmental issues</td></tr>
</table>

		8. Security and surveillance **9. Education and skills** **10. Waste management** **10. Any other issues**
8.1	**Guidelines for Faculty Members**	• Any one of the sub-themes can be taken as survey topics • It will be a group assignment. • There should be not more than 10 students in each group. • The faculty guide will guide the students to complete the survey and help the student in preparing final report. • The questionnaire should be well design by the school and it should carry at least 40 questions (Including demographic questions). • The faculty will guide each group of students to prepare the PPT. • Each group should **submit the report** to CCC-Coordinator signed by the faculty guide before one week of last date of instruction mentioned in the Academic Calendar. • The students have to send the hard copy of the **report and PPT**, and then only they will be allowed for ETE.
8.2	**Role of CCC-Coordinator**	The CCC Coordinator will supervise the whole process and assign students to faculty members.
8.3	**Layout of the Report**	Abstract (250 words) • Introduction • Literature review(optional) • Objective of the research • Research Methodology • Finding and discussion • Conclusion and recommendation • References • Research report should base on primary data.
8.4	**Guideline for Report Writing**	**Title Page: The following elements must be included:** • Title of the article; • Name(s) and initial(s) of author(s), preferably with first names spelled out; • Affiliation(s) of author(s); • Name of the faculty guide and Co-guide **Abstract:** Each article is to be preceded by a succinct abstract, of up to 250 words, that highlights the objectives, methods, results, and conclusions of the paper. **Text: Manuscripts should be submitted in Word.**

		• Use a normal, plain font (e.g., 12-point Times Roman) for text. • Use italics for emphasis. • Use the automatic page numbering function to number the pages. • Save your file in docx format (Word 2007 or higher) or doc format (older Word versions) **Reference list:** The list of references should only include works that are cited in the text and that have been published or accepted for publication. The soft copy of final report should be submitted along with the **hard copy signed by faculty / guide and countersigned by HoD / Dean.** **The report will be subject to plagiarism check as per the guidelines given in the notification.**
8.5	**Format:**	**The report should be Spiral / softbound** The Design of the Cover page to report will be given by the Coordinator- CCC Cover page Acknowledgement Content Project report Appendices
8.6	**Important Dates:**	Students will complete their community survey before last instruction date of the running semester and submit the same to concern faculty member. (Each group should complete min 50 questionnaires). Faculty members should guide students for report writing. The students should submit the hard copy and soft copy of the report to CCC-Coordinator signed by the faculty guide. **The students should submit the soft copy of the PPT to CCC-Coordinator signed by the faculty guide before 1 week of final presentation.** **The final presentation and evaluation should be organised by the School before last instruction date.**
8.7	**ETE**	**The students will be evaluated by panel of internal faculty members on the basis of their presentation.**

9	**Course Evaluation**	
9.01	**Continuous Assessment**	**60%**
	Noting responses to the questionnaire	**20 Marks**
	Data analysis and Report Writing	**40 Marks**
9.02	**ETE (PPT presentation)**	**40%**

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: ME		**Semester: V**
1	Course Code	**ARP 301**
2	Course Title	**Quantitative Aptitude Behavioural And Interpersonal Skills**
3	Credits	2
4	Contact Hours (L-T-P)	1-0-2
	Course Status	Active
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 3rd phase of employability enhancement and skill building activity exercise.
6	Course Outcomes	After completion of this course, students will be able to: CO1: Apply skills of personality development which will help a student groom to meet the needed social strata for establishing themselves in the society CO2: Build a positive behavioural attitude and attributes developing interpersonal skills for building positive and meaningful social and professional relationships CO3: Review and revise development plans to adapt to changing aspirations, circumstances and working environments CO4: Acquire higher level competency in use of numbers and digits, logical and analytical reasoning CO5: Develop higher level strategic thinking and diverse mathematical concepts through building cubes and cuboids. CO6: Demonstrate higher level quantitative aptitude such as analytical and statistical tools for making business decisions.
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**
	A	What is Personality?| Creating a positive impression – The 3 V's of Impression | Individual Differences and Personalities
	B	Personality Development and Transformation | Building Self Confidence | Behavioural and Interpersonal Skills
	C	Avoiding Arguments | The Art of Assertiveness | Constructive Criticism | The Personal Effectiveness Grid | Assessing our Strengths & Limitations and Creating an Action Plan for Learning with the 4M Model | Verbal Abilities-3
	Unit 2	**Introduction to APTITUDE TRAINING- Reasoning- Logical/ Analytical**
	A	Numbers & Digits , Mathematical Operations | Analytical Reasoning
	B	Cubes & Cuboids | Statement & Assumptions
	C	Strong & Weak Argument
	Unit 3	**Quantitative Aptitude**
	A	Work & Time ,Pipes & Cistern
	B	Time ,Speed & Distance, Quadratic & Linear Equations, Logs & Inequalities
	C	Sequence & Series, Logarithms, Data Interpretation | Data sufficiency - Level 1
	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

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: MECH		**Semester: 3rd**
1	Course Code	**MEP251**
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	• To align student's skill and interests with a realistic problem or project • To understand the significance of problem and its scope • Students will make decisions within a framework
6	Course Outcomes	Students will be able to: CO1: Identify and formulate problem statement with systematic approach. CO2: Develop teamwork and problem-solving skills, along with the ability to communicate effectively with others. CO3: Design the problem solution as per the problem statement framed. CO4: Classify and understand techniques for software verification and validation of project successfully. CO5: Fabricate and implement the solution by using different aspects of programming language. CO6: Develop a glory of the need to engage in life-long learning.
7	Course Description	In PBL-1, the students will learn how to define the problem for developing projects, identifying the skills required for developing the project based on given a set of specifications and all subjects of that Semester.
8	Outline syllabus	
	Unit 1	Problem Definition, Team/Group formation and Project Assignment. Finalizing the problem statement, resource requirement, if any.
	Unit 2	Develop a work flow or block diagram for the proposed System / software.
	Unit 3	Design algorithms for the proposed problem.
	Unit 4	Implementation of work under the guidance of a faculty member and obtain the appropriate results.

	Unit 5	Demonstrate and execute Project with the team. Validate and verify the project modules.		
		Report should include Abstract, Hardware / Software Requirement, Problem Statement, Design/Algorithm, Implementation Detail. Validation Reports. References if any. The presentation, report, work done during the term. Supported by the documentation, forms the basis of assessment.		
	Mode of examination	Practical /Viva		
	Weight age Distribution	CA	MTE	ETE
		60%	NA	40%

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		
1	Course Code	MEP495
2	Course Title	Summer Internship I
3	Credits	2
4	Contact Hours (L-T-P)	0-0-4
	Course Status	Compulsory
5	Course Objective	To expose engineering students to the real industrial scenario, which is not possible in the classroom? Familiarize with various materials, processes, products and their applications along with relevant aspects of quality control and shop floor management. Understand the psychology of the workers and their habits, attitudes and approach to problem solving. Understand the social, economic and administrative considerations that influence the working environment of industrial organizations. Learn about team work, collaboration and leadership.Importance of time management, discipline, self-learning and effective communication. To apply the engineering knowledge in real industrial situations. To gain experience in writing reports in engineering works/projects. To enhance the employability of the students. Get exposed to the current technological developments relevant to the subject area to which the training pertains. To develop self-esteem for employment after graduation
6	Course Outcomes	On successful completion of this course, the students will be able to CO1: Infer the working environment of industry. CO2: Analyze the resources in practice. CO3: Apply Engineering Knowledge for Problem analysis CO4: Decide investigative procedure to sort out complex industrial problems CO5: Interpret the importance of working in a team CO6: Maximize his/her ability to make work related presentations.
7	Course Description	This practical course is intended to expose the students to real life scenario in industry with the intention to make them future ready for their professional role. In this, the students undergo in reputed Private / Public Sector / Government organization / companies for four weeks/one month in summer vacation after II semester. It is expected that the skills student gain via internship with an organization will help him/her perform better in the assigned job after graduation. Apart from this, the industrial internship enhances the chance for students to obtain employment after graduation. It is pertinent to mention that developing an awareness of general workplace

		behaviour and interpersonal skills are expected from students at the end of the Industrial internship. The student should be able relate, apply and adapt relevant knowledge and concepts within industrial ambience and ethics.
8	Outline	
	A	**INTERNSHIP DIARY**
		An internship diary is provided by the university for collecting the information during industrial internship on daily basis. It also helps the student for writing his/her report. The objective of maintaining daily diary is to cultivate the habit of documenting and encourage him/her to search for details. It develops the students' own thought process and reasoning abilities. The students should record in the daily training diary the day to day account of the observations, impressions and information gathered. It should contain the sketches & drawings related to the observations made by the students. On the basis of recorded data in the diary, the student will prepare a report.
	B	**INTERSHIP REPORT**
		A student should learn about equipments, machines, plant layout and other industrial practices in industry. After collecting the information, one should prepare a comprehensive internship report at the end of one's internship to demonstrate what one has learnt in this period. Daily diary will facilitate to a great extent in writing the report. It is mandatory for the student to submit a hard copy of report to one's assigned coordinator for corrections and subsequently, submitting a final spiral bound copy to department. The assigned coordinator will check the followings things in the draft submitted by the student: Report is made as per the format approved by the department. Originality of the report Very adequate and purposeful write-up. Organization, drawings, sketches, format, style, language, fig no, table no and references etc. Variety and relevance of learning experience. After doing correction the corrected copies will be submitted at the time of presentation, duly signed by the faculty coordinator and Head of Department.
	C	**INDUSTRIAL INTERNSHIP EVALUATION PROCESS**
		The Industrial Internship Evaluation is done in the presence of assigned Department Faculty coordinator and External Examiner, duly approved by The controller of Examination. The evaluation process includes a seminar presentation and viva-voce, done on the basis of following criteria. The Power Point Presentation Proper Planning of Presentation Effectiveness of Presentations Depth of knowledge and skills. Records in which internship diary and reports are analyzed along with presentation and viva voce
	Mode of examination	Practical

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: V**
1	Course Code	MEP 356
2	Course Title	Technical Skill Enhancement Course-1
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	• To enable the students to compile and communicate their work effectively in the form of technical report and/or technical presentation • To understand the significance of the microstructure in determining different properties • To understand, design and formulate case studies
6	Course Outcomes	After this course the students will be able CO1: Apply the Microsoft Office applications CO2: Compile their findings in the form of a technical report and/or technical presentation CO3: Apply and analyse recent applications through case studies CO4: Design and perform case studies on their own CO5: Infer the importance of microstructural world CO6: Communicate their recent findings
7	Course Description	The course is designed to make the students understand the importance of effective communication. The course primarily aims to brush up the soft skills of the students. The students are also expected to develop the habit of self-learning as the course proceeds.
8	Outline syllabus	
	List of Exercises	
	Exercise 1	Application of Microsoft PowerPoint
	Exercise 2	Application of Microsoft Word
	Exercise 3	Application of Microsoft Excel
	Exercise 4	Technical Report writing
	Exercise 5	Preparing a Technical Presentation

	Exercise 6	Case Study: Introduction, Procedure, Advantages, Limitations and Documentation		
	Exercise 7	Discussion on latest case studies		
	Exercise 8	Introduction to the Microstructural world		
	Exercise 9	Report writing and Presentation by the students on the latest development in Mechanical engineering related Industry		
	Exercise 10	Report writing and Presentation by the students on the latest development in Mechanical engineering related Industry		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch:		**Semester: II**
1	Course Code	EEE112
2	Course Title	Principles of Electrical and Electronics Engineering
3	Credits	3
4	Contact Hours (L-T-P)	2-1-0
	Course Status	Compulsory
5	Course Objective	To provide the students with an introductory concept in the field of electrical and electronics engineering to facilitate better understanding of the devices, techniques and equipments used in engineering applications.
6	Course Outcomes	CO1: Analyze and solve basic electrical circuits CO3: Infer the working principle of transformer. CO3: Explain the working principle of dc and ac motors. CO4: Apply the basics of diode to describe the working of rectifier circuits such as half and full wave rectifiers CO5: Apply the concepts of basic electronic devices to design various circuits CO6: Apply the basic concepts in Electrical and Electronics Engineering for multi-disciplinary tasks
7	Course Description	This initial course introduces the concepts and fundamentals of electrical and electronic circuits and devices. Topics include basic circuit analysis, diode and transistor fundamentals and applications. This course also introduces working principle and applications of dc/ac motors and transformers.
8	Outline syllabus	
	Unit 1	**DC & AC Circuits (6 lectures)**
	A	Electrical circuit elements (R, L and C), series and parallel circuits, concept of equivalent resistance, Kirchhoff current and voltage laws, star-delta conversion
	B	Analysis of simple circuits with dc excitation and Superposition Theorem, Representation of sinusoidal waveforms, peak and rms values, real power, reactive power, apparent power, power factor
	C	Introduction to three phase system, relationship between phase voltages and line voltages,
	Unit 2	**Transformer(4 lectures)**

	A	Working principle and construction of transformer, EMF equation		
	B	Efficiency of transformer, Power and distribution transformer and difference between them		
	C	Transformer applications in transmission and distribution of electrical power		
	Unit 4	**Electrical Motors (6 lectures)**		
	A	Construction, working principle, torque-speed characteristic and applications of dc motor.		
	B	Construction, working principle and applications of a three-phase induction motor, significance of torque-slip characteristic		
	C	Working principle starting methods and applications of single phase induction motor		
	Unit 4	**Semiconductor Diode and Rectifier (5 lectures)**		
	A	PN junction and its biasing		
	B	Semiconductor diode, ideal versus practical diode , VI characteristics of diode		
	C	Half wave and full wave rectifiers with and without filters.		
	Unit 5	**Transistors (5 lectures)**		
	A	Bipolar Junction Transistor (BJT) – Construction, working principle and input-output characteristics		
	B	BJT as CE amplifier and as a switch		
	C	Introduction to JFET		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010. 2. S. K. Bhattacharya, “Basic Electrical and Electronics Engineering”, Pearson Publication. 3. Robert L Boylestad, “Electronic Devices and Circuit Theory” Pearson Education, 2009		
	Other References	1. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.		

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: VII**
1	Course Code	EEE332
2	Course Title	Power Electronics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To know the power electronics devices, basic structure, symbol and characteristics. 2. To understand the topologies and analyze ac to dc, dc to dc and dc to ac converters.
6	Course Outcomes	CO1: Compare the working mechanism of semi-conductor devices CO2: Analyse and design DC-DC converters CO3: Predict the behaviour of phase-controlled converters CO4: Evaluate the performance of AC-AC and AC-DC converters CO5: Improve the functioning of different voltage source for inverters CO6: Choose the converters for real time applications
7	Course Description	The field of power electronics encompasses the application of fundamental concepts in several disciplines: electronic devices and circuits, variable speed drives and control systems. Variable speed drives has resulted automation in production processes. The use of electric cars, electric trains and electric subway trains can substantially reduce urban pollution problems. Students learn power electronics devices like thyristors, MOSFET, IGBT, GTO etc., various phase controlled single phase and three phase rectifiers with performance factors, dual converters, principle of dc to dc conversion, class A,B,C,,D,E,F Choppers, commutation techniques, comprehensive treatment of dc to ac inverters, ac voltage converters and cycloconverters.
8	Outline syllabus	
	Unit 1	**Power semiconductor Devices**
	A	Power semiconductor devices their symbols and static characteristics: Characteristics and specifications of switches
	B	Operation, steady state and switch characteristics, switching limits of Power Transistor Operation and steady state

		characteristics of Power MOSFET and IGBT		
	C	Snubber circuit, Series and parallel operation of thyristors, Commutation techniques of thyristor, methods of turn-on of thyristor, operation of GTO, MCT and TRIAC		
	Unit 2	**DC-DC Converters**		
	A	Principles of step-down chopper, step down chopper with R-L		
	B	Load Principle of step-up chopper, and operation with RL load		
	C	Classification of choppers. Buck and boost converter.		
	Unit 3	**Phase Controlled Converters**		
	A	Single phase line commutated converters: single phase half controlled converter with resistive and inductive loads, Single phase fully controlled converter, mid point and bridge connections with resistive and inductive loads, effect of freewheeling diode, performance parameters, effect of source inductance, single phase dual converter.		
	B	Three phase line commutated converters: Three phase half wave converter, three phase fully controlled and half controlled converters with resistive and inductive loads, effect of freewheeling diode, performance parameters, effect of source inductance, three phase dual converter.		
	C	Single phase half wave controlled rectifier with resistive and inductive loads, effect of freewheeling diode.		
	Unit 4	**AC Voltage Controllers**		
	A	Principle of On-Off and phase control, Single phase two SCRs in anti parallel with R and RL load		
	B	Triac with R and RL load, Three phase ac voltage controllers (various configurations and comparison only)		
	C	Cyclo Converters: Basic principle of operation, single phase to single phase, three phase to single phase and three phase to three phase cyclo converters, output voltage equation.		
	Unit 5	**Inverters**		
	A	Single phase series resonant inverter, single phase bridge inverter		
	B	Three phase bridge inverters, Voltage control of inverters		
	C	Harmonics reduction techniques, Single phase and three phase current source inverters.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. M.H. Rashid,"Power Electronics: Circuits, Devices &		

		Applications", Prentice Hall of India, Ltd. 3rd Edition,2004 2. V.R. Moorthy, "Power Electronics : Devices, Circuits and Industrial Applications" Oxford, University Press,2007. 3. M.D.Singh & K.B.Khanchandani, "Power Electronics", Tata McGraw Hill publishing company, 1989
	Other References	1. M.S. Jamil Asghar, "Power Electronics" Prentice Hall of India Ltd., 2004. 2. Chakrabarti &Rai, "Fundamentals of Power Electronics & Drives" DhanpatRai& Sons.

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch		**Mechanical Engineering**
1	Course Code	ECE002
2	Course Title	Microcontrollers and Applications
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Compulsory
5	Course Objective	• Embedded Systems and design issues • Advanced Computer Architecture • Embedded System Installation/ Configuration using AVR microcontroller • Development of Embedded Firmware using AVR microcontroller • Troubleshooting and Maintenance of embedded system
6	Course Outcomes	On successful completion of this course, students will be able to CO1: Apply and illustrate advanced computer architecture CO2: Embedded system installation/ configuration using AVR microcontroller CO3: Apply different modes, Input Capture and Compare Match. in controller CO4: Interpret the programmes by using interrupts and timer CO5: Development of Embedded Firmware for peripheral functions
7	Course Description	In this course, the fundamentals of embedded system hardware and firmware design will be explored. Issues such as embedded processor selection, hardware/firmware partitioning, glue logic, circuit design, circuit layout, circuit debugging, development tools, firmware architecture, firmware design, and firmware debugging will be discussed. The AVR, a very popular 8 microcontroller family, will be studied. The architecture and instruction set of the microcontroller will be discussed, and a wire wrapped microcontroller board will be built and debugged by each student. The course will culminate with a significant final project which will extend the concepts covered earlier in the course. Learning may be supplemented with periodic guest lectures by embedded systems engineers from industry
8	Outline syllabus	
	Unit 1	**AVR RISC Microcontrollers**

	A	Introduction to AVR RISC Microcontrollers, Architecture overview, status register, general purpose register file, memories,		
	B	Instruction set, Data Transfer Instructions, Arithmetic and Logic Instructions, Branch Instructions		
	C	Bit and Bit-test Instructions, MCU Control Instructions. Simple programs in Assembly Language / C Language		
	Unit 2	**Interrupts and Timer**		
	A	Introduction to System Clock, Reset sources,		
	B	Introduction to interrupts, External interrupts, IO Ports, 8-bit and 16-bit Timers,		
	C	Introduction to different modes, Input Capture and Compare Match.		
	Unit 3	**Inbuilt Peripheral Functions**		
	A	Analog Comparator, Analog-to-Digital Converter, Serial Peripheral Interface (SPI),		
	B	The Universal Synchronous and Asynchronous serial Receiver and Transmitter (USART),		
	C	Two Wire Interface (TWI) / I2C bus		
Mode of examination		Theory		
Weightage Distribution		CA	MTE	ETE
		30%	20%	50%
Text book/s*		1.AVR Microcontroller and Embedded Systems: Using Assembly and C by Muhammad Ali Mazidi, Sarmad Naimi, Sepehr Naimi, PHI 2. Embedded system Design - Frank Vahid and Tony Givargis, John Wiley, 2002		
Other References		1.Programming and Customizing the AVR Microcontroller by D V Gadre, McGraw- Hill 2. Atmel AVR Microcontroller Primer: Programming and Interfacing by Steven F. Barrett, Daniel J. Pack, Morgan & Claypool Publishers 3. An Embedded Software Primer by David E Simon, Addison Wesley 4. AVR Microcontroller Datasheet, Atmel Corporation, www.atmel.com		

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: Physics		**Semester: I,II**
1	Course Code	PHY 151
2	Course Title	Physics Lab 1
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
6	Course Outcomes	On successful completion of the course the students will have: CO1: Knowledge and study of basic physics experiments based on simple harmonic motion CO2: Conduct the experiment and calculate modulus of rigidity, Young's modulus of engineering materials. CO3: Determine moment of inertia of different bodies. CO4: Draw the characteristic curves of different electronic components CO5:Evaluate the frequency of an electrically maintained tuning fork using Melde's Experiment CO6: Apply the mathematical concepts/equations to obtain quantitative results and ability to conduct, analyze and interpret experiments
7	Outline Syllabus	
	Unit 1	To verify the relation of time period using simple pendulum. To determine the acceleration due to gravity and radius of Gyration of compound pendulum and compare with theoretical value.
	Unit 2	To measure the moment of inertia of a flywheel. To determine the Young's modulus of a beam using cantilever beam experiment apparatus. To determine vertical distance between two points using sextant.
	Unit3	To determine the modulus of rigidity of a material of a given wire with an inertia table (torsion pendulum) by dynamical method. To calculate Moment of inertia of different irregular shapes.
	Unit 4	To determine the frequency of an electrically maintained tuning fork using Melde's Apparatus. (i) Transverse mode of vibration (ii) Longitudinal mode of vibration. To determine the coefficient of viscosity of water by Poiseuille's method.

	Unit 5	To draw the characteristic curve of a PN junction diode. To trace the circuit of a Half Wave Rectifier circuit and determine efficiencies and ripple factors with capacitor and inductor filters. To trace the circuit of a Full Wave Rectifier circuit and determine efficiencies and ripple factors with capacitor and inductor filters.		
	Mode of Examination	Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text books	1. B.Sc. Practical Physics- Harnam Singh, S. Chand Publishing. 2. B.Sc. Practical Physics- C L Arora, S. Chand Publishing.		
	Other References	1. Geeta Sanon, BSc Practical Physics, 1st Edn. (2007), R. Chand & Co. 2. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New		

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: ME/CE		**Semester: I**
1	Course Code	PHY119
2	Course Title	Mechanics
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	1. To know the mechanics, vectors and law of physics 2. To classify different physical quantities and forms of energy. 3. To get introduced to various types of motions and equations related to it also to understand the different types of rotational motions 4. To analyse the theorems, moment of inertia of different geometrical shapes
6	Course Outcomes	CO1: Analyze and Interpret relations of various the motion and equilibrium conditions of physical systems CO2: Interpret the importance of physical quantities and energetics, and vector analysis CO3: Analyze the equations of motions and simple harmonic equations and its applications CO4: Apply various theorems related to inertia and their application to calculate moment of inertia CO5: Analyze the kinematic and kinetic behavior of rotating rigid bodies. CO6: Interpret the dynamic behavior of particles and rigid bodies with engineering applications.
7	Course Description	This course is about physics quantities related to mechanics. Different types of motions and their equations involved are the part of this course. It will also involve different body's moment of inertia.
8	Outline syllabus	
	Unit 1	Fundamentals of Mechanics
	A	Measurement of fundamental and derived quantities, International system of units, accuracy, precision of instruments and errors in measurement.
	B	Scalar and vector quantities, addition, subtraction and multiplication of vectors.
	C	Gradient, divergence and curl and their physical significance.
	Unit 2	Kinetics of Particles
	A	Concept of Force, work, power and energy; Law of conservation of energy;

		Potential energy, Conservative forces;		
	B	Centre of mass, Conservation law of momentum; Collision of bodies; Centre of mass frame of reference, Laboratory frame of reference		
	C	Free body diagrams, equilibrium & its equations, applications.		
	Unit 3	Linear Motion of Rigid Bodies		
	A	Angular Momentum of a Particle and System of Particles. Torque.		
	B	Conservation of Angular Momentum. Rotation about a Fixed Axis		
	C	Kinetic Energy of Rotation. Motion involving both Translation and Rotation.		
	Unit 4	Centroid and Moment of Inertia		
	A	Moment of inertia, Parallel Axes Theorem, Perpendicular axes theorems, Principal Moment of Inertia,		
	B	Mass Moment of Inertia of Circular Ring, Disc, Cylinder, Sphere and Cone about their axis.		
	C	Centre of gravity and Moment of Inertia of triangular body and Rectangular body.		
	Unit 5	Rotational Motion of Rigid Bodies		
	A	Oscillations, Simple harmonic oscillations, Equation of Simple Harmonic Motion;		
	B	Potential and Kinetic Energy of a Harmonic Oscillator and their variation,		
	C	Simple pendulum, Compound Pendulum		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Principles of physics, J. Walker, D. Halliday and R. Resnick, Wiley India pvt. Ltd.		
	Other References	1. Mechanics, D.S. Mathur, S. Chand & Co. 2. Engineering Mechanics by Irving H. Shames, Prentice-Hall 3. The Feyman Lectures on Physics, volume 1.		

School: SET		Batch: 2019-2023
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: Physics		**Semester: I**
1	Course Code	PHY152
2	Course Title	Advanced Physics Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	To gain practical knowledge by applying the experimental methods to correlate with the Physics theory.
6	Course Outcomes	On successful completion of the course the students will have: CO1: Apply physics experimentation on Semiconductors, energy band gap, Planck constant. CO2: Estimate variation of magnetic field through a current carrying coil and hall effect. CO3: Determine the size of fine particle using laser diffraction CO4: Determine the wavelength of laser source using diffraction technique CO5: Apply the various optical experiments related to engineering applications. CO6: Apply the mathematical concepts/equations to obtain quantitative results and ability to conduct, analyse and interpret experiments.
7	Outline Syllabus	
	Unit 1	To determine Energy band gap of a semiconductor using Four Probe method. To determine the variation of magnetic field along the axis of a current carrying coil and estimate the radius of the coil. To study Hall effect and determine the Hall coefficient, carrier density and the mobility of a semiconductor material
	Unit 2	To draw hysteresis curve (B-H curve) of a specimen in the form of a transformer on a C.R.O. And to determine its hysteresis loss To determine the Planck's constant by measuring radiation in a fixed spectral range. To determine the specific resistance of the material of a given wire using Carey Foster's bridge.

	Unit3	To determine the diameter of thin wire by diffraction using laser. To determine the wavelength of laser light by diffraction at a single slit. To determine slit width of single and double slit by using Laser.		
	Unit 4	To determine the wavelength of prominent lines of mercury by plane diffraction grating. To determine the wavelength of monochromatic light by Newton's Ring method.		
	Unit 5	To determine the focal length of the combination of two lenses separated by a distance with the help of a nodal slide and to verify the formula. To verify Stefan's Law.		
	Mode of Examination	Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text books	3. B.Sc. Practical Physics- Harnam Singh, S. Chand Publishing. 4. B.Sc. Practical Physics- C L Arora, S. Chand Publishing.		
	Other References	3. Geeta Sanon, BSc Practical Physics, 1st Edn. (2007), R. Chand & Co. 4. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New		

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: MECH		**Semester: 4**
1	Course Code	**MEP252**
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: Create better work habits towards learning CO2: Take part in brain storming activities CO3: Formulate their goals and objectives towards the research problem CO4: Improve their soft skills like communication, presentation etc. CO5: Evaluate the extent to which goals are achieved CO6: Make use of Technology to convert ideas into products
7	Course Description	In PBL-2, the students will learn how to define the problem for developing projects, identifying the skills required for developing the project based on given a set of specifications and all subjects of that Semester.
8	Outline syllabus	
	Unit 1	Problem Definition, Team/Group formation and Project Assignment. Finalizing the problem statement, resource requirement, if any.
	Unit 2	Develop a work flow or block diagram for the proposed system / software.
	Unit 3	Design algorithms for the proposed problem.
	Unit 4	Implementation of work under the guidance of a faculty member and obtain the appropriate results.
	Unit 5	Demonstrate and execute Project with the team. Validate and verify the project modules.

		Report should include Abstract, Hardware / Software Requirement, Problem, Statement, Design/Algorithm, Implementation Detail. Validation Reports. References if any. The presentation, report, work done during the term, supported by the documentation, forms the basis of assessment.		
	Mode of examination	Practical /Viva		
	Weight age Distribution	CA	MTE	ETE
		60%	NA	40%

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: Mechanical Engineering		**Semester: V**
1	Course Code	MEP 357
2	Course Title	Technical Skill Enhancement Course-2
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	• To enable the students to compile and communicate their work effectively in the form of technical report and/or technical presentation • To understand the significance of the microstructure in determining different properties • To understand, design and formulate case studies
6	Course Outcomes	After this course the students will be able CO1: To understand and apply the Microsoft Office applications CO2: To compile their findings in the form of a technical report and/or technical presentation CO3: To understand and analyse recent case studies CO4: To design and perform case studies on their own CO5: To understand the importance of microstructure CO6: To effectively communicate their findings
7	Course Description	The course is designed to make the students understand the importance of effective communication. The course primarily aims to brush up the soft skills of the students. The students are also expected to develop the habit of self-learning as the course proceeds.
8	Outline syllabus	
	List of Exercises	
	Exercise 1	Application of Microsoft PowerPoint
	Exercise 2	Application of Microsoft Word
	Exercise 3	Application of Microsoft Excel
	Exercise 4	Technical Report writing
	Exercise 5	Preparing a Technical Presentation
	Exercise 6	Case Study: Introduction, Procedure, Advantages, Limitations and Documentation
	Exercise 7	Discussion on latest case studies

	Exercise 8	Introduction to the Microstructural world		
	Exercise 9	Report writing and Presentation by the students on the latest development in Mechanical engineering related Industry		
	Exercise 10	Report writing and Presentation by the students on the latest development in Mechanical engineering related Industry		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%

School: SET		**Batch: 2019-2023**
Program: B.Tech.		**Current Academic Year: 2019-2020**
Branch: MECH		**Semester: 5**
1	Course Code	**MEP351**
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	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: Adapt general metacognitive knowledge strategies CO2:Solve the complex problems efficiently CO3: Relate deeply with the target content CO4:Develop constructive cumulative goal orientation acquisition process CO5: Build scientific writing skills by means of regular progress presentation CO6: Utilize technology-based knowledge to improvise the existing designs
7	Course Description	In PBL-3, the students will learn how to define the problem for developing projects, identifying the skills required for developing the project based on given a set of specifications and all subjects of that Semester.
8	Outline syllabus	
	Unit 1	Problem Definition, Team/Group formation and Project Assignment. Finalizing the problem statement, resource requirement, if any.
	Unit 2	Develop a work flow or block diagram for the proposed system / software.
	Unit 3	Design algorithms for the proposed problem.
	Unit 4	Implementation of work under the guidance of a faculty member and obtain the appropriate results.
	Unit 5	Demonstrate and execute Project with the team. Validate and verify the project modules.

		Report should include Abstract, Hardware / Software Requirement, Problem Statement, Design/Algorithm, Implementation Detail. Validation Reports. References if any. The presentation, report, work done during the term supported by the documentation, forms the basis of assessment.		
	Mode of examination	Practical /Viva		
	Weight age Distribution	CA	MTE	ETE
		60%	NA	40%

School: SET		**Batch: 2019-2023**	
Program: B.Tech.		**Current Academic Year: 2019-2020**	
1	Course number	**FEP102**	
2	Course Title	**Functional EnglishBeginners** 2	
3	Credits	1	
4	Contact Hours (L-T-P)	1-0-0 (However contact hours are 2 hours per week)	
5	Course Objective	To equip students to minimize the linguistic barriers emerging in a different environment. 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.	
6	Course Outcomes	Students would be able to: CO1: Develop key skills of basic writing. CO2: Formulate comprehension and summary of the text writing. CO3: Develop English vocabulary through exercises CO4: Apply English expressions for thought and action CO5: Interpret correct grammatical elements in English writing CO6: Apply various styles to express opinions in the written and oral.	
7	Outline syllabus: **Functional English II**		
7.01	FEP102.A	Unit A	**Writingskills 1**
7.02	FEP102.A1	Unit A Topic 1	Descriptive
7.03	FEP102.A2	Unit A Topic 2	Explanatory
7.04	FEP102.A3	Unit A Topic 3	Argumentative
7.05	FEP102.B	Unit B	**Writing skills 2**
7.06	FEP102.B1	Unit B Topic 1	Summarising the stories
7.07	FEP102.B2	Unit B Topic 2	Paraphrasing of passages
7.08	FEP102.B3	Unit B Topic 3	Précis writing of passages
7.09	FEP102.C	Unit C	**Vocabulary Enhancement**

7.10	FEP102.C1	Unit C Topic 1	One word Substitution
7.11	FEP102.C2	Unit C Topic 2	Phrasal Verbs
7.12	FEP102.C3	Unit C Topic 3	Comprehension based Vocabulary exercises
7.13	FEP102.D	Unit D	
7.14	FEP102.D1	Unit D Topic 1	The Gift of the Maggi by O.Henry (through audio aids)
7.15	FEP102.D2	Unit D Topic 2	Robbie by Isaac Asimov (through visual aids)
7.16	FEP102.D3	Unit D Topic 3	God Sees The Truth, But Waits by Leo Tolstoy (Textual Reading)
		Unit E	
7.17	FEP102.E1	Unit E Topic 1	Jam sessions
7.18	FEP102.E2	Unit E Topic 2	Discussions based on texts from Unit D
7.19	FEP102.E3	Unit E Topic 3	Group Discussion (simple day to day topics)
8	**Course Evaluation**		
8.1	Course work:30%		
8.2	Attendance	None	
8.3	Homework	5assignments, 5marks	
8.4	Quizzes	5 best quizzes (based on assignments); 15 marks	
8.5	Lab	Pearson	
8.6	Presentations/Project	10	
8.7	Any other	None	
8.9	MTE	One,20%	
8.10	End-term Examination: One,50%		
9	References		
	Text book	• Workbook for Beginners	
	Other references	• 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.	

School: SET		**Batch: 2019-2023**		
Program: B.Tech.		**Current Academic Year: 2019-2020**		
Branch: MECH		**Semester: II**		
1	Course number	**FEP104**		
2	Course Title	**Functional English Intermediate-2**		
3	Credits	1		
4	Contact Hours (L-T-P)	1-0-0 (However Contact hours : 2 hrs in a week)		
5	Course Pre-requisite	A skill-based course designed for undergraduate students with basic understanding of Englishlanguage		
6	Course Objective	To guide the students to hone the basic communication skills: listening, speaking, reading andwriting. To equip students to minimize the linguistic and socio-cultural barriers emerging in a differentenvironment. To help students to understand different accents and standardise their existing English.		
7	Course Outcomes	Students would be able to: CO1: Utilize receptive language skills in order to comprehend complex factual/literary textCO2: Develop the skills of long complex speeches and lectures CO3: Synthesize complex concepts and present them in creative writing CO4: Express opinions about complex subjects by developing arguments through productivelanguage skills CO5: Recognize and apply vocabulary and grammatical knowledge to express thought andaction CO6: Evaluate arguments in terms of the strength of evidence and reasoning		
8	Outline syllabus: **Functional English Intermediate-2**			
			TOPICS	**Ref. & Chapter**
8.01	FEP104.A	**UNIT A**	**LISTENING & DISCUSSION**	
8.02	FEP104.A1	Topic 1	Class discussion on Steven Spielberg's Commencement Speech at Harvard	Ref 3, Ref 2
8.03	FEP104.A2	Topic 2	Informative listening (Comprehension): Lecture by Johan Rockstrom: Let the Environment Guideour Development	Ref 4, Ref 2

8.04	FEP104.A3	Topic 3	Expressing views on lessons learnt from the "Inspirational Speech for Students by Dr. APJ Abdul Kalam"	Ref 5, Ref 2
8.05	FEP104.B	**UNIT B**	**READING TEXT & DISCUSSION**	
8.06	FEP104.B1	Topic 1	Short Stories: *"The Tiger in The Tunnel"* by Ruskin Bond (Comprehension & Critical Analysis)	Ref 6, Ref 2
8.07	FEP104.B2	Topic 2	Poetry: *"Where the Mind is Without Fear"* by Rabindranath Tagore (Critical Appreciation and Discussion)	
8.08	FEP104.B3	Topic 3	*"The Coffee House of Surat"* by Leo Tolstoy (Comprehension & Critical Analysis)	
8.09	FEP104.C	**UNIT C**	**CREATIVE WRITING & DISCUSSION**	
8.10	FEP104.C1	Topic 1	Short Story Writing	Ref 2
8.11	FEP104.C2	Topic 2	Picture Interpretation	
8.12	FEP104.C3	Topic 3	Review Writing	
8.13	FEP104.D	**UNIT D**	**TECHNICAL WRITING**	
8.14	FEP104.D1	Topic 1	Emails & formal Letters	Ref 1 (pages 478 to 593)
8.15	FEP104.D2	Topic 2	Technical Reports (Informative & Routine based)	
8.16	FEP104.D3	Topic 3	Technical Proposal	
8.17	FEP104.E	**UNIT E**	**VOCABULARY BUILDING AND GRAMMAR (THROUGH READING AND LISTENING THE TEXTS)**	
8.18	FEP104.E1	Topic 1	Phrasal Verbs; Idioms and Phrases; Proverbs; Functional Vocabulary; Notional Concepts; Connectors and Linkers	Ref 2
8.19	FEP104.E2	Topic 2	Text based activities on: Non-finite verbs; Reported Speech (Dialogue Writing); Passives (Imperative sentences); Process description; Spotting error; Relative clauses.	
8.20	FEP104.E3	Topic 3	Spellings and Punctuations	

9	**Course Evaluation**		
9.1	Course work: 30%		
9.2	Attendance	None	
9.3	Homework	10 assignments, no weight	
9.4	Quizzes	6 best quizzes (based on assignments); 20 marks	
9.5	Lab		
9.6	Presentations	None	
9.7	Any other	None	
9.9	MTE	One, 20%	
9.10	End-term Examination: One, 50%		
10	Reference Books, Videos and Internet:		
	Text book	1. Communication Skills by Sanjay Kumar and PushpLata, OUP Publications. 2. Functional English Workbook (Intermediate) 2	
	Videos and Internet	3. Steven Spielberg's Commencement Speech at Harvard(https://www.youtube.com/watch?v=TYtoDunfu00) 4. Let the Environment Guide our Development (http://www.ted.com/talks/johan_rockstrom_let_the_environment_guide_our_developme nt) 5. Inspirational Speech for Students by Dr. APJ Abdul Kalam (https://www.youtube.com/watch?v=7E-cwdnsiow) 6. Reading texts	

School: SET		**Batch: 2018-22**
Program: B.Tech.		**Current Academic Year: 2018-19**
Branch: MECH		**Semester: 6**
1	Course Code	**MEP352**
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	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: Build self-directed learning CO2: Demonstrate the acquired knowledge in solving complex realistic problem CO3: Utilize and analyse various software, designing and modelling tools CO4: Develop a product that would be suitable as well as sustainable CO5: Solve the realistic problems of academia and industry CO6: Estimate the engineering and societal values of the developed process or product
7	Course Description	In PBL-4, the students will learn how to define the problem for developing projects, identifying the skills required for developing the project based on given a set of specifications and all subjects of that Semester.
8	Outline syllabus	
	Unit 1	Problem Definition, Team/Group formation and Project Assignment. Finalizing the problem statement, resource requirement, if any.
	Unit 2	Develop a work flow or block diagram for the proposed system / software.
	Unit 3	Design algorithms for the proposed problem.
	Unit 4	Implementation of work under the guidance of a faculty member and obtain the appropriate results.
	Unit 5	Demonstrate and execute Project with the team. Validate and verify the project modules.

		Report should include Abstract, Hardware / Software Requirement, Problem Statement, Design/Algorithm, Implementation Detail. Validation Reports. References if any. The presentation, report, work done during the term supported by the documentation, forms the basis of assessment.		
	Mode of examination	Practical /Viva		
	Weight age Distribution	CA	MTE	ETE
		60%	NA	40%