Program and Course Structure
School of Engineering and Technology
Department of Mechanical Engineering
Program: B.Tech Mechanical Engineering
Program code: SET0601
(Batch: 2021-2025)

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

1.2 Vision and Mission of the School of Engineering and Technology

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.

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

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: 2021-2025
TERM: I

S. No.	Course Code	Course Name	Teaching Load			Credits
			L	T	P	
Theory Courses						
1.	CSE113	Programming for Problem Solving	3	0	0	3
2.	HMM126	Human Values	2	0	0	2
3.	MTH142	Calculus and Abstract Algebra	3	1	0	4
4.	PHY117	Mechanics Physics	3	1	0	4
5.	ARP101	Communicative English-1	1	0	0	1
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.	PHY161	Physics Lab1	0	0	2	1
9.	MEP106	Computer Aided Design & Drafting Lab	0	0	3	1.5
10.	ARP101	Communicative English-1	0	0	2	1
TOTAL CREDITS						**19.5**

School of Engineering and Technology
B.Tech- Mechanical Engineering
Batch: 2021-2025
TERM: II

S. No.	Course Code	Course Name	Teaching Load			Credits
			L	T	P	
Theory Courses						
1.	CSE114	Application based Programming in Python	3	0	0	3
2.	MTH145	Probability and Statistics	3	1	0	4
3.	EEE112	Principles of Electrical and Electronics Engineering	2	1	0	3
4.	EVS112	Environmental Studies	2	0	0	2
5.	MEP201	Idea Generation and Creativity Lab	1	0	0	1
6.	ARP102	Communicative English -2	1	0	0	1
Practical/Viva-Voce/Jury						
7.	CEP114	Application based Programming in Python Lab	0	0	2	1
8.	EEP112	Principles of Electrical and Electronics Engineering Lab	0	0	2	1
9.	MEP105	Mechanical Workshop	0	0	3	1.5
10.	ARP102	Communicative English -2	0	0	2	1
11.	MEP201	Idea Generation and Creativity Lab	0	0	2	1
TOTAL CREDITS						**19.5**

School of Engineering and Technology
B.Tech- Mechanical Engineering
Batch: 2021-2025
TERM: III

S. No.	Course Code	Course Name	Teaching Load			Credits
			L	T	P	
Theory Courses						

1.	MEC232	Manufacturing Technology - I	3	0	0	3
2.	MEC235	Introduction to Thermal Engineering I	3	0	0	3
3.	MEC230	Strength of Materials	3	1	0	4
4.	MEC236	Materials Science	3	0	0	3
5.	ARP203	Logical Skills Building and Soft Skills	1	0	0	1
6.	MEC234	Research methodology	2	0	0	2
Practical/Viva-Voce/Jury						
7.	ARP203	Logical Skills Building and Soft Skills	0	0	2	1
8.	MEP232	Manufacturing Technology - I Lab	0	0	2	1
9.	MEP235	Introduction to Thermal Engineering I Lab	0	0	2	1
10.	MEP255	Solid Mechanics Lab	0	0	2	1
11.	MEP230	CAD modeling through solid works lab 1	0	0	2	1
12.	MEP233	Summer Internship I	0	0	4	2
13.	MEP231	Project Based Learning-1	0	0	4	2
TOTAL CREDITS						**25**

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TERM: IV

S. No.	Course Code	Course Name	Teaching Load			Credits
			L	T	P	
Theory Courses						
1.	MEC221	Manufacturing Technology – II	3	0	0	3
2.	MEC 237	Introduction to Thermal	3	0	0	3

		Engineering II				
3.	MEC 238	Mechanics of Machines	3	1	0	4
4.	PE I	Program Elective I	3	0	0	3
5.	ARP204	Quantitative and Qualitative Aptitude Skill Building	1	0	0	1
6.	OE I	Open Elective I	2	0	0	2
7.	MEC239	Entrepreneurship	2	0	0	2
8.	BTY223	Introduction to Biology	2	0	0	2
Practical/Viva-Voce/Jury						
9.	ARP204	Quantitative and Qualitative Aptitude Skill Building	0	0	2	1
10.	MEP232	Project Based Learning-2	0	0	4	2
11.	MEP238	Mechanics of Machines Lab	0	0	2	1
TOTAL CREDITS						**24**

School of Engineering and Technology
B.Tech- Mechanical Engineering
Batch: 2021-2025
TERM: V

S. No.	Course Code	Course Name	Teaching Load			Credits
			L	T	P	
Theory Courses						
1.	MEC331	Machine Design	3	1	0	4
2.	MEC339	Production, planning and control	3	0	0	3
3.	PE II	Program Elective II	3	0	0	3
4.	OE II	Open Elective III	2	0	0	2
5.	ARP 301	Personality Development and Decision making Skills	1	0	0	1
Practical/Viva-Voce/Jury						

6.	ARP 301	Personality Development and Decision making Skills	0	0	2	1
7.	MEP356	Technical Enhancement Course I	0	0	2	1
8.	MEP331	Project Based Learning 3	0	0	2	2
9.	MEP333	Summer Internship II	0	0	4	2
10	ECC301	Community Connect	00	0	4	2
11	MEP360	Automobile Engineering Lab 1	0	0	2	1
						22

School of Engineering and Technology
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TERM: VI

S. No.	Course Code	Course Name	Teaching Load			Credits
			L	T	P	
Theory Courses						
1.	MEC330	Operations Research	3	0	0	3
2.	MEC341	Lean production	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.	PE- V	Program Elective -V	3	0	0	3
6.	OE III	Open Elective IV	3	0	0	3
7.	ARP302	Campus to Corporate	1	0	0	1
Practical/Viva-Voce/Jury						

10.	ARP302	Campus to Corporate	0	0	2	1
11	MEP330	Operations Research Lab	0	0	2	1
12	MEP 397	CNC Lab	0	0	2	1
13.	MEP314	Technical Skills Enhancement Course 2	0	0	2	1
12.	MEP332	Project Based Learning 4	0	0	4	2
TOTAL CREDITS						**25**

School of Engineering and Technology
B.Tech- Mechanical Engineering
Batch: 2021-2025
TERM: VII

S. No.	Course Code	Course Name	Teaching Load			Credits
			L	T	P	
Theory Courses						
1.	HMM305	Management course	3	0	0	3
2.	PE VI	Program Elective VI	3	0	0	3
3.	PE VII	Program Elective – VII	2	0	0	2
4.	OE IV	Open Elective – IV	2	0	0	2
5.	OE V	Open Elective – V	3	0	0	3
Practical/Viva-Voce/Jury						
6.	MEP433	Summer Internship III	0-	0	4	2
7.	MEP460	Major Project-I	0	0	4	2
TOTAL CREDITS						**17**

School of Engineering and Technology
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Batch: 2021-2025
TERM: VIII

S. No.	Course Code	Course Name	Teaching Load			Credits
			L	T	P	
Practical/Viva-Voce/Jury						
1.	MEP461	Major Project-II	0	0	16	8
TOTAL CREDITS						**8**

Specialization in Automobile Engineering:

S. No	Course Code	Course Name	L	T	P	C	Category	TERM
1	MEC314	Automotive Transmission	3	0	0	3	Engineering/Other	III
2	MEC329	Automotive Electrical and Electronics Systems	3	0	0	3	Engineering/Other	IV
3	AUT 306	Electric Vehicle Technology	3	0	0	3	Engineering/Other	V
4	AUT 307	Automotive Chassis	3	0	0	3	Engineering/Other	VI
5	AUT 308	Vehicle Dynamics	3	0	0	3	Engineering/Other	VII
		Total Credits to be taken				15		

Specialization in Mechatronics:

S. No	Course Code	Course Name	L	T	P	C	Category	TERM
1	MEC310	Design of Mechatronics System	3	0	0	3	Engineering/Other	III
2	ECE092	Control System Engineering	3	0	0	3	Engineering/Other	IV
3	ECE093	Digital Electronics	3	0	0	3	Engineering/Other	V
4	MEC364	Sensors and Signal	3	0	0	3	Engineering/Other	VI

		Processing						
5	MEC365	Robotics and Machine Vision System	3	0	0	3	Engineering/Other	VII
		Total Credits to be taken				15		

List of Program Electives							
S. No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Category**
1	MEC433	IC Engines	3	0	0	3	Engineering
2	MEC356	Refrigeration and Air Conditioning	3	0	0	3	Engineering
3	MEC355	Computer Integrated Manufacturing	3	0	0	3	Engineering
4	MEC357	Introduction to six sigma	2	0	0	2	Engineering
5	MEC358	Material Characterization Techniques	3	0	0	3	Engineering
6	MEC359	Heat Treatment of Metals and Alloys	3	0	0	3	Engineering
7	MEC360	Advanced Engineering Materials	3	0	0	3	Engineering
8	MEC318	Supply chain management	3	0	0	3	Engineering
9	MEC361	Hydraulic machines	3	0	0	3	Engineering
10	MEC334	Introduction to Robotics Engineering	3	0	0	3	Engineering
11	AUT301	Automotive Safety Systems	2	0	0	2	Engineering
12	AUT302	Auto Certification and Homologation	3	0	0	3	Engineering
13	AUT303	Automotive Suspension and Steering Systems	2	0	0	2	Engineering
14	AUT304	Vehicle Inspection and Maintenance	3	0	0	3	Engineering

15	AUT305	Automotive Chassis	3	0	0	3	Engineering
16	EEE332	Power Electronics	3	0	0	3	Engineering
17	MIC008	Virtual Instrumentation	3	0	0	3	Engineering
18	MEC362	Micro Electro Mechanical Systems	3	0	0	3	Engineering
19	MEC363	Numerical methods with MATLAB	2	0	2	3	Engineering
20	ECE002	Microcontroller and Applications	2	0	0	2	Engineering

Additional credits for Minor in Program							
S. No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Category Prerequisite**
1	MEC232	Manufacturing Technology-I	3	0	2	4	Engineering
2	MEC342	Manufacturing Technology-II	3	0	0	3	Engineering
3	MEC339	Production planning and control	3	0	0	3	Engineering
4	MEC341	Lean Production	3	0	0	3	Engineering
5	MECE334	Introduction to Robotics	3	0	0	3	Engineering
6	MEC318	Supply chain Management	3	0	0	3	Engineering
7	MEP428	CNC LAB	0	0	2	1	Engineering
		Total Credits to be taken				20	

Additional credits for Honours in Program							
S. No	**Course Code**	**Course Name**	**L**	**T**	**P**	**C**	**Category Prerequisite**
1	MCH001	Mechanical Behavior of Nanomaterials	3	0	0	3	Engineering
2	MCH002	Material Behaviors and Failure Prediction	3	0	0	3	Engineering
3	MCH003	Intermediate Fluid Mechanics	3	0	0	3	Engineering
4	MCH004	Design for Additive Manufacturing	3	0	0	3	Engineering

5	MCH005	Finite Element Methods in Solid Mechanics	3	0	2	4	Engineering
6	MCH006	Design with Composite Materials	3	0	2	4	Engineering
		Total Credits to be taken				20	

School: SET		**Batch: 2021-2025**
Program: B.Tech.		**Current Academic Year: 2021-22**
Branch: ALL		**Semester:1**
1	Course Code	CSE113
2	Course Name	Programming for problem solving
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Core
5	Course Objective	1. Learn basic programming constructs –data types, decision structures, control structures in C 2. learning logic aptitude programming in c language 3. Developing software in c programming
6	Course Outcomes	Students will be able to: CO1: 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**
	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: 2021-2025**
Program: B.Tech.		**Current Academic Year: 2021-22**
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	Practical

	examination			
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	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		
Softwares		Turbo C		

School: SET		Batch: 2021-2025	
Program: B.Tech.		Current Academic Year: 2021-22	
1	Course Code	HMM126	
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	HMM126.A	Unit 1	The Need and Process for Value Education
7.02	HMM126.A1	Unit 1 Topic 1	The need, basic guidelines, content and process for Value Education
7.03	HMM126.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	HMM126.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	HMM126.B	Unit 2	Understanding Harmony in the Human Being - Harmony in Myself
7.06	HMM126.B1	Unit 2 Topic 1	Human being as a co-existence of the sentient 'I' and the material 'Body'
7.07	HMM126.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	HMM126.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	HMM126.C	Unit 3	Harmony in the Family and Society
7.10	HMM126.C1	Unit 3 Topic 1	Values in human-human relationship; Trust and Respect as the foundational values of relationship
7.11	HMM126.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	HMM126.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	HMM126.D	Unit 4	Harmony in the Nature and Existence
7.14	HMM126.D1	Unit 4 Topic 1	The harmony in the Nature
7.15	HMM126.D2	Unit 4 Topic 2	Interconnectedness and mutual fulfilment among the four orders of nature recyclability and self-regulation in nature
7.16	HMM126.D3	Unit 4 Topic 3	Understanding Existence as Co-existence of mutually interacting units in all-pervasive space
7.17	HMM126.E	Unit 5	Competence in professional ethics
7.18	HMM126.E1	Unit 5 Topic 1	Ability to utilize the professional competence for augmenting universal human order
7.19	HMM126.E2	Unit 5 Topic 2	Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,
7.20	HMM126.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: 2021-2025**
Program: B.Tech.		**Current Academic Year: 2021-22**
Branch: CSE		**Semester: 1**
1	Course Code	**MTH 142**
2	Course Title	**Calculus and Abstract Algebra**
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.
6	Course Outcomes	CO1: Interpret the basic Taylor's expansion of a function of two variables and maxima and minima of a function of two variables CO2: Evaluate surface using the concepts of double integrals. CO3: Apply basics of determinants, rank of matrices for linear systems. CO4: Interpret the basic concept of sets, relation, functions, groups, rings and field. CO5: Investigate the properties of vector spaces and subspaces using by linear transformations. CO6: Apply the concepts of eigen values, eigen vectors and diagonalisation in linear systems
7	Course Description	This course is an introduction to the fundamental of Mathematics. The primary objective of the course is to develop the basic understanding of differential and integral calculus, linear Algebra and Abstract Algebra.
8	**Outline syllabus: Calculus and Abstract Algebra**	
	Unit 1	**Calculus**
	A	Differentiation, Taylor's and Maclaurin theorems with remainders; indeterminate forms, L' Hospital's rule.
	B	Maxima and minima, Partial derivatives, Euler's theorem.
	C	Total derivative. Evaluation of double integration. Applications of double integral (to calculate area).
	Unit 2	**Matrices**

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

School: SET		**Batch: 2021-2025**
Program: B.Tech.		**Current Academic Year: 2021-22**
Branch: CSE/EC/EEE		**Semester: II**
1	Course Code	PHY 117
2	Course Title	Semiconductor Physics
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	To make students proverbial with the fundamental concepts of Semiconductors materials and their real life applications for configuring various electronics devices.
6	Course Outcomes	After the completion of this course, a student will be able to CO1: Apply the basic experiments based on Semiconductors, energy band gap, planck constant in engineering system. CO2: Evaluate variation of magnetic field through a current carrying coil and hall effect using the concept of electricity and magnetism CO3: Determine the specific resistance of various systems. CO4: Apply the fundamentals of laser physics in the laser assisted experiments. CO5: Analyze the use of various optoelectronic devices used in the system. CO6: Apply the mathematical concepts/equations to obtain quantitative results and ability to conduct, analyze and interpret experiments
7	Course Description	This course provides the basic foundation for understanding electronic semiconductor devices and their applications and limitations. It has introductory elements of various concept of material science. This course is essential for students who desire to specialize their engineering in Computer Sciences, Electronics, and Electronics and Electrical engineering.
8	Outline Syllabus	
	Unit 1	**Physics of Semiconductor**
	A	Introduction, classical free electron theory (Lorentz-Drude theory and limitations), Quantum theory of free electron
	B	(Fermi energy, effect of temperature on Fermi-Dirac distribution) (qualitative analysis)
	C	Energy bands, Classification of Solids on the basis of energy band.
	Unit 2	**Transport phenomena in semiconductors**
	A	Mobility, conductivity, electrons and holes in an intrinsic semiconductors, Donor and Acceptor impurities (n-type and p-type semiconductor)
	B	Fermi levels , carrier densities in semiconductor
	C	Concentration of electrons in conduction band and holes in valence band, Drift and

		diffusion current, Hall effect.		
	Unit 3	**p-n Junction**		
	A	p-n junction, types of p-n junction (step-graded and Linearly-graded junction)		
	B	formation of depletion region, barrier potential, Zener diode, Characteristics of Zener diode		
	C	Avalanche and Zener breakdown, comparison of Zener diode and pn junction diode, concept of tunneling, I-V characteristics of tunnel diode.		
	Unit 4	**Laser Physics**		
	A	Coherent sources, interaction of radiation with matter (spontaneous and stimulated emission), Einstein's relation		
	B	population inversion and pumping, active components of laser, optical amplification or gain		
	C	threshold condition for laser action, three and four level lasers, Ruby and He-Ne lasers.		
	Unit 5	**Optoelectronic Devices**		
	A	Optical sources: Light emitting diode (construction, basic working principle)**,** semiconductor laser (construction, basic working principle)		
	B	optical detectors: photodiode (working principle), p-i-n photodiode (working principle),		
	C	Photovoltaic effect, p-n junction solar cell (basic working idea).		
	Mode of Examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text books	Integrated Electronics- Millman - Halkias, Tata Mc Graw Hill		
	Other References	1. Semiconductor Devices Physics and Technology- S M Sze, John Wiley & Sons 2. Semiconductor Device Fundamentals- Robert F. Pierret Addison Wesley Longman. 3. Semiconductor Devices- Kanaan Kano, Pearson Education. 4. Basic Electronics by B.L Thareja 5. Principles of Electronics by V.K Mehta		

School: School of Engineering and Technology		**Batch: 2021-25**
Program: B.Tech.		**Current Academic Year: 2021-22**
Branch: Physics		Semester: I,II
1	Course Code	PHY 161
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	
	A	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.
	B	
	C	
	Unit 2	
	A	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.
	B	
	C	
	Unit3	
	A	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.
	B	
	C	
	Unit 4	
	A	To determine the frequency of an electrically maintained tuning fork using Melde's Apparatus. (i) Transverse mode of vibration (ii) Longitudinal mode of
	B	

	C	vibration. To determine the coefficient of viscosity of water by Poiseuille's method.		
	Unit 5			
	A B C	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	B.Sc. Practical Physics- Harnam Singh, S. Chand Publishing. B.Sc. Practical Physics- C L Arora, S. Chand Publishing.		
	Other References	Geeta Sanon, BSc Practical Physics, 1st Edn. (2007), R. Chand & Co. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New		

School: SET		**Batch: 2021–25**
Program: BTech		**Current Academic Year: 2021– 22**
Branch: ME		**Semester: I**
1	Course Code	MEP 107
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: Interpret the mechanical characteristics of engineering materials and its application CO5: Classify different plant layouts used in engineering applications. CO6: Interpret use of various production systems in the plant layout.
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		
		Total Hours		
	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. Ganeshan, TMH Publication 2. Refrigeration and Air Conditioning, P.K Nag, TMH Publication		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch: ALL		**Semester: I**
1	Course Code	MEP 106
2	Course Title	Computer Aided Design & Drafting Laboratory
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 knowledge of drawing, editing and viewing tool to create two dimensional engineering drawings in AutoCAD. CO3: Choose advance features to present an engineering drawing in AutoCAD. CO4: Create an engineering drawing by implementing dimension techniques. CO5: Construct orthographic projections from a pictorial view. CO6: Apply the knowledge of AutoCAD in various industrial practice.
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 in 3D modeling, manufacturing, and engineering will also be explored. No drafting or computer experience is necessary.
8	Outline syllabus	
	Experiment 1	Introduction to AutoCAD and its interface
	Experiment	Working with coordinates, Drawing ofline, circle, arc, polygon and creating sketches

	2			
	Experiment 3	Editing of drawing by using editing Tools and Power tools		
	Experiment 4	Creating of advanced feature like fillet, chamfer, hatch and using of block		
	Experiment 5	Representing text and dimensioning in AutoCAD		
	Experiment 6	Creating the drawingsof mechanical components by using AutoCAD features.		
	Experiment 7	Creating the electrical circuit drawings in AutoCAD.		
	Experiment 8	Drawing plan and elevation of various buildings in AutoCAD.		
	Experiment 9	Creating the drawing of renowned constructions such as Taj Mahal in AutoCAD		
	Experiment 10	Creating of orthographic projections from a pictorial views		
	Mode	Practical		
	Weightage	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	1. Ibrahim Zaid,"CAD/CAM- Theory and Practice", McGraw Hill, International Edition.		
	Software	AutoCAD		

Schools: SET		Batch : 2021-2022
		Academic Year: 2021-2022
		Semester: 1st
1	Course Code	**ARP101**
2	Course Title	Communicative English-1
3	Credits	2
4	Contact Hours (L-T-P)	1-0-2
5	Course Objective	To minimize the linguistic barriers that emerges in varied socio-linguistic environments through the use of English. Help students to understand different accents and standardise their existing English. Guide the students to hone the basic communication skills - listening, speaking, reading and writing while also uplifting their perception of themselves, giving them self-confidence and building positive attitude.
6	Course Outcomes	After completion of this course, students will be able to: CO1 Develop a better understanding of advanced grammar rules and write grammatically correct sentences CO2 Acquire wide vocabulary and punctuation rules and learn strategies for error-free communication. CO3 Interpret texts, pictures and improve both reading and writing skills which would help them in their academic as well as professional career CO4 Comprehend language and improve speaking skills in academic and social contexts CO5 Develop, share and maximise new ideas with the concept of brainstorming and the documentation of key critical thoughts articulated towards preparing for a career based on their potentials and availability of opportunities. CO6 Function effectively in multi-disciplinary teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality
7	Course Description	The course is designed to equip students, who are at a very basic level of language comprehension, to communicate and work with ease in varied workplace environment. The course begins with basic grammar structure and pronunciation patterns, leading up to apprehension of oneself through written and verbal expression as a first step towards greater employability.
8	Outline syllabus – ARP 101	
	Unit A	**Sentence Structure**
	Topic 1	Subject Verb Agreement
	Topic 2	Parts of speech

	Topic 3	Writing well-formed sentences
	Unit B	**Vocabulary Building & Punctuation**
	Topic 1	Homonyms/ homophones, Synonyms/Antonyms
	Topic 2	Punctuation/ Spellings (Prefixes-suffixes/Unjumbled Words)
	Topic 3	Conjunctions/Compound Sentences
	Unit C	**Writing Skills**
	Topic 1	Picture Description – Student Group Activity
	Topic 2	Positive Thinking - Dead Poets Society-Full-length feature film - Paragraph Writing inculcating the positive attitude of a learner through the movie | SWOT Analysis – Know yourself
	Topic 3	Story Completion Exercise –Building positive attitude - The Man from Earth (Watching a Full length Feature Film)
	Topic 4	Digital Literacy | Effective Use of Social Media
	Unit D	**Speaking Skill**
	Topic 1	Self-introduction/Greeting/Meeting people – Self branding
	Topic 2	Describing people and situations - To Sir With Love (Watching a Full length Feature Film)
	Topic 3	Dialogues/conversations (Situation based Role Plays)
	Unit E	**Professional Skills | Career Skills**
	Topic 1	Exploring Career Opportunities
	Topic 2	Brainstorming Techniques & Models
	Topic 3	Social and Cultural Etiquettes
	Topic 4	Internal Communication
	Unit F	**Leadership and Management Skills**
	Topic 1	Managerial Skills
	Topic 2	Entrepreneurial Skills
9	Evaluations	Class Assignments/Free Speech Exercises / JAM Group Presentations/Problem Solving Scenarios/GD/Simulations (60% CA and 40% ETE
10	Texts & References | Library Links	Blum, M. Rosen. How to Build Better Vocabulary. London: Bloomsbury Publication Comfort, Jeremy (et.al). Speaking Effectively. Cambridge University Press

School: SET		Batch : 2021-2025
Program: B.Tech		Current Academic Year: 2021-22
Branch: CSE		Semester: II
1	Course Code	CSE114
2	Course Title	Application Based Programming in Python
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	Emphasis is placed on procedural programming, algorithm design, and language constructs common to most high-level languages through Python Programming.
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1. 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	**Introduction**
	A	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 Function and Methods with Lists.
	B	Strings: Introduction, Accessing items of a string, Operations, Working, Library Functions and Methods with strings. **Tuple:** Introduction, Accessing tuples, Operations, Working, Library Functions and Methods with Tuples.
	C	Sets: Introduction, Operations, Working, functions with sets. Difference between set and lists. **Dictionaries :**Introduction, Accessing values in dictionaries, Working with dictionaries, Library Functions
	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, Except clause, Try, finally clause, User Defined Exceptions

	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	File Handling: Introduction, File Operations		
	Unit 5	**Application based programming**		
	A	**Modules& packages :**Importing module, Math module, Random module, creating Modules		
	B	Introduction to Numpy, pandas, Matplotlib		
	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*	1. The Complete Reference Python, Martin C. Brown, McGraw Hill		
	Other References	1. Introduction to computing in problem solving using Python, E Balahurusamy, McGraw Hill 2. Introduction to programming using Python, Y. Daniel Liang, Pearson 3. Mastering Python, Rick Van Hatten, Packet Publishing House 4. Starting out with Python, Tony Gaddis, Pearson		

School: SET		**Batch: 2021-2025**		
Program: B.Tech		**Current Academic Year: 2021**		
Branch:All		**Semester: II**		
1	Course Code	CSP114		
2	Course Title	Application Based Programming in Python Lab		
3	Credits	1		
4	Contact Hours (L-T-P)	0-0-2		
	Course Status	Compulsory		
5	Course Objective	Emphasis is placed on procedural programming, algorithm design, and language constructs common to most high level languages through Python Programming.		
6	Course Outcomes	Upon successful completion of this course, the student will be able to: CO1. Apply decision and repetition structures in program design. CO2. Implement methods and functions to improve readability of programs. CO3. Demonstrate the use of Python lists, tuples and dictionaries CO4. Elaborate 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 dictionaries**		
		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*	1. The Complete Reference Python, Martin C. Brown, McGraw Hill		

	Other References	1. Introduction to computing in problem solving using Python, E Balagurusamy, McGraw Hill 1. Introduction to programming using Python, Y. Daniel Liang, Pearson 1. Mastering Python, Rick Van Hatten, Packet Publishing House 1. Starting out with Python, Tony Gaddis, Pearson

School: SET		**Batch : 2021- 2025**
Program: B.Tech.		**Current Academic Year: 2021-22**
Branch: ME		**Semester: II**
1	Course Code	**MTH 145**
2	Course Title	**Probability and Statistics**
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	Course Status	Compulsory
5	Course Objective	The objective of this course is to familiarize the students with statistical techniques. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.
6	Course Outcomes	CO1: Illustrate the concepts of sample space, events and compute the probability and conditional probability of events, and use Bayes' Rule CO2: Solve basic problems in probability theory, including problems involving the binomial, geometric, exponential, Poisson, and normal distributions CO3: Perform a regression analysis, and compute and interpret the coefficient of correlation. CO4: Interpret the applications of method of least square Curve fitting in evaluating straight lines, second degree parabolas and more general curves and compute the sampling distributions, sampling distributions of means and variances CO5: Apply and examine the goodness-of-fit test, test for independence, and homogeneity using testing hypothesis. CO6: Recognize the role of and application of probability theory, descriptive and inferential statistics in many different fields
7	Course Description	This course is an introduction to the fundamental of Mathematics. The primary objective of the course is to develop the basic understanding of statistics including measures of central tendency, correlation and regression, statistical methods of data sampling, probability and random variables and various discrete and continuous probability distributions and their properties.
8	**Outline syllabus :Probability and Statistics**	
	Unit 1	**Basic Probability**
	A	Probability spaces, conditional probability, Bayes' rule.
	B	Discrete random variables, Independent random variables
	C	Expectation of Discrete Random Variables, Chebyshev's Inequality
	Unit 2	**Discrete and Continuous Probability Distributions**

	A	Discrete Probability distributions: Binomial, Poisson.		
	B	Continuous random variables and their properties, distribution functions and densities.		
	C	Normal, exponential and gamma distribution.		
	Unit 3	**Statistics**		
	A	Moments, skewness and Kurtosis.		
	B	Correlation and regression – Rank correlation.		
	C	Bivariate distributions and their properties.		
	Unit 4	**Applied Statistics**		
	A	Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves.		
	B	Test of significance: Large sample test for single proportion,		
	C	Difference of proportions, single mean, difference of means, and difference of standard deviations.		
	Unit 5	**Testing Hypothesis**		
	A	Test for single mean, difference of means		
	B	test for ratio of variances		
	C	Chi-square test for goodness of fit and independence of attributes		
	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. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint). 3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.		
	Other References	1. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968. 2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
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 : 2021-2025**
Program: B. Tech		**Current Academic Year: 2021-2022**
Branch: All		**Semester: I**
1	Course Code	EVS-112
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			

Schools: SET | SOL | SMFE | SBS-BBA | SBSR | SOE | SAP		**Batch :** 2021-22
		Current Academic Year: 2021-2022
		Semester: 2nd (Second)
1	Course Code	**ARP102**
2	Course Title	Communicative English -2
3	Credits	2
4	Contact Hours (L-T-P)	1-0-2
5	Course Objective	To Develop LSRW skills through audio-visual language acquirement, creative writing, advanced speech et al and MTI Reduction with the aid of certain tools like texts, movies, long and short essays.
6	Course Outcomes	After completion of this course, students will be able to: CO1 Acquire Vision, Goals and Strategies through Audio-visual Language Texts CO2 Synthesize complex concepts and present them in creative writing CO3 Develop MTI Reduction/Neutral Accent through Classroom Sessions & Practice CO4 Determine their role in achieving team success through defining strategies for effective communication with different people CO5 Realize their potentials as human beings and conduct themselves properly in the ways of world. CO6 Acquire satisfactory competency in use of Quantitative aptitude and Logical Reasoning
7	urse Description	The course takes the learnings from the previous semester to an advanced level of language learning and self-comprehension through the introduction of audio-visual aids as language enablers. It also leads learners to an advanced level of writing, reading, listening and speaking abilities, while also reducing the usage of L1 to minimal in order to increase the employability chances.
8	Outline syllabus – ARP 102	
	Unit 1	**Acquiring Vision, Goals and Strategies through Audio-visual Language Texts**
	Topic 1	Pursuit of Happiness / Goal Setting & Value Proposition in life
	Topic 2	12 Angry Men / Ethics & Principles
	Topic 3	The King's Speech / Mission statement in life | strategies & Action Plans in Life

	Unit 2	**Creative Writing**
	Topic 1	Story Reconstruction - Positive Thinking
	Topic 2	Theme based Story Writing - Positive attitude
	Topic 3	Learning Diary Learning Log – Self-introspection
	Unit 3	**Writing Skills 1**
	Topic 1	Precis
	Topic 2	Paraphrasing
	Topic 3	Essays (Simple essays)
	Unit 4	**MTI Reduction/Neutral Accent through Classroom Sessions & Practice**
	Topic 1	Vowel, Consonant, sound correction, speech sounds, Monothongs, Dipthongs and Tripthongs
	Topic 2	Vowel Sound drills , Consonant Sound drills, Affricates and Fricative Sounds
	Topic 3	Speech Sounds | Speech Music| Tone | Volume| Diction |Syntax |Intonation | Syllable Stress |
	Unit 5	**Gauging MTI Reduction Effectiveness through Free Speech**
	Topic 1	Jam sessions
	Topic 2	Extempore
	Topic 3	Situation-based Role Play
	Unit F	**Leadership and Management Skills**
	Topic 1	Innovative Leadership and Design Thinking
	Topic 2	Ethics and Integrity
	Unit F	**Universal Human Values**
	Topic 1	Love & Compassion, Non-Violence & Truth
	Topic 2	Righteousness, Peace
	Topic 3	Service, Renunciation (Sacrifice)
	Unit G	**Introduction to Quantitative aptitude & Logical Reasoning**
	Topic 1	Analytical Reasoning & Puzzle Solving
	Topic 2	Number Systems and its Application in Solving Problems
9	Evaluations	Class Assignments/Free Speech Exercises / JAM Group Presentations/Problem Solving Scenarios/GD/Simulations (60% CA and 40% ETE
10	Texts & References | Library Links	• Wren, P.C.&Martin H. High English Grammar and Composition, S.Chand& Company Ltd, New Delhi. • Blum, M. Rosen. How to Build Better Vocabulary. London:

		Bloomsbury Publication • Comfort, Jeremy(et.al). Speaking Effectively. Cambridge University Press. The Luncheon by W.Somerset Maugham - http://mistera.co.nf/files/sm_luncheon.pdf

School: SET		**Batch : 2021-2025**		
Program: B.Tech		**Current Academic Year: 2021-2022**		
Branch: Mechanical Engineering		**Semester: II**		
1	Course Code	MEP201		
2	Course Title	Idea Generation and Creativity 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 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. Build the importance of creativity in solving complex problems 2. Analyze the observation skills through an understanding of creativity models. 3. Discuss the process and tools of new design thinking. 4. To provide the understanding for the mock review of presentation (generating solutions and ideas in classroom through discussion). 5. To identifying the fundamental problems and resolving the issues. 6. To define the final presentation detailing the solution to the selected problem/new modification.		
7	Course Description	This course focuses on the understanding of generating different ideas by creating new concepts to reality; it also brings workshop on-good engineering practices (GEP).		
8	Outline syllabus			
	List of Experiments			
	Experiment 1	Introduction and presentation on creative ideas that changed the world/Case studies		
	Experiment 2	To discuss on various engineering issues/deficiencies in existing product/propose new design for an existing product.		
	Experiment 3	To explore various ideas to tackle/list alternative solutions/challenges/ logical approach/what are the constraints/most economical		
	Experiment 4	Mock review of the presentation (generating solutions and ideas in classroom through discussion)		
	Experiment 5	To Identifying and resolving the issues		
	Experiment 6	Final presentation detailing the solution to the selected problem/new modification.		
	Experiment 7	To create the experiential learning concepts		
	Experiment 8	Developing and Validating-Proof of Concept.		
	Mode of examination	Practical		
	Weight- age Distribution	CA	MTE	ETE
		60%	0%	40%

	Text book/s*	Mechanical Design Engineering Handbook,Peter R N Child
		Garrat,S., "Motor Vehicles" , Butterworthy London,13th edition.
		Bosch Hand Book, 3rd Edition, SAE,1993
		MSC Software from http://pages.mscsoftware.com/MSC_Symposium2012_Vehicle_Home.htm

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
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	On successful completion of this course, students will be able to CO1: Apply 5S (Seiri, Seiton, Seiso, Seiketsu and Shitsuke) methodology at workplace. CO2: Select various hand tools used in basic mechanical engineering workshop viz. black smithy, carpentry, assembling, welding etc. CO3: Choose different measuring devices according to the job CO4: Explain various machine tools and their operation CO5: Classify suitable tools for machining processes including turning, facing, thread cutting and tapping, milling, drilling and shaping. CO6: Buildup basic knowledge of workshop to manufacture basic metallic or wooden components
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 joint as 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.		
8	Outline syllabus			
	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 mould, using the given single piece pattern		
	Experiment 10	To prepare a sand mould, 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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: ME		**Semester: III**
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: choose the various casting methods for product making with their advantages and disadvantages. CO2 Design solution for the different types of welding processes in metal joining. CO3 Choose appropriate bulk deformation processes line rolling, forging, Extrusion CO4 Analyse the various processes involved in sheet metal forming with its applications and salient features and Familiarize about the manufacturing processes used for plastic materials. CO5 Apply correct procedure while measuring the dimension of a component CO6 Apply the manufacturing technology and quality checking for a specific product.
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	**Metrology**		
	A	Terminologies associated with metrology, Surface plate, Tolerance, Limits and Fits: Hole basis system, Shaft basis system and Selective assembly		
	B	Linear measurement, Angular measurement and Thread measurement		
	C	Surface texture, Gauge and Gauge design		
	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 : 2021-25**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch: Mechanical Engineering		**Semester: II**
1	Course Code	MEC235
2	Course Title	Introduction to Thermal Engineering - I
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	To appreciate the rate processes connected with momentum and heat transfer and develop the ability to make first estimates of the rates.
6	Course Outcomes	After completion of this course, students will be able to: CO1. Deal with pressure variation in static fluids and in manometers CO2. solve simple problems involving mass balance, momentum balance and energy balance CO3. Appreciate the mechanics of fluid-dynamic drag of bodies CO4. Solve conduction problems (including unsteady problems) in one-dimension CO5. Calculate the convective heat transfer in simple situations CO6. Solve problems of radiative exchange using circuit analogy.
7	Course Description	The course introduces rate processes in fluid mechanics and in heat transfer. The course confines itself largely to be able to same simple estimates and use dimensionless parameters
8	Outline syllabus	
	Unit 1	**Introduction/ Fluid Statics**
	A	Fluid and its properties
	B	Pressure and forces variations in static fluids
	C	Manometry
	Unit 2	**Fluid kinematics and dynamics**
	A	Field description, acceleration, and momentum balance
	B	mass balance and momentum balance
	C	Bernoulli equation, engineering energy equation
	Unit 3	**Drag on bodies**
	A	Concept of boundary layer
	B	Variations of drag with shape of bodies and with speeds
	C	Magnus effect
	Unit 4	Heat Transfer basics
	A	Fourier law and 1-D conduction.
	B	Fins
	C	Unsteady heat transfer
	Unit 5	**Convection and radiative heat transfer**
	A	Basic ideas of convection. Forced convection
	B	Internal convection and free convection

	C	Basic concepts of radiation		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Gupta and Gupta, Fluid Mechanics and Its Applications, New Age, 2018 Gupta, Elements of Heat Transfer, New Age 2021		
	Other References			

School: SET		**Batch : 2021-2025**
Program: B. Tech		**Current Academic Year: 2021-2022**
Branch: Mechanical Engineering		**Semester: IV**
1	Course Code	MEC230
2	Course Title	Strength of Materials
3	Credits	3
4	Contact Hours (L-T-P)	3-1-0
	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 the action 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 the adequacy of mechanical and structural elements under different loads is essential for the design 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

School: SET		**Batch :**
Program: B.Tech		**Current Academic Year:**
Branch: Mechanical Engineering		**Semester: III**
1	Course Code	MEC236
2	Course Title	Materials Science
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
5	Course Status	Regular
6	Course Outcomes	On successful completion of this course the students will be able to: CO1: Describe the structure and imperfections present in crystalline solids CO2: Explain the reasons behind variations in mechanical properties of different categories of materials CO3: Analyse phase diagrams and subsequently utilize it to predict the microstructure CO4: Compare and contrast the structure and properties of different constituents of Iron-carbon system CO5: Summarise the composition, properties and applications of different ferrous and non-ferrous alloys; and conduct materials testing CO6: Analyse the structure and performance of metal-alloy systems
7	Course Description	The course focuses on the structure, defects and strengthening mechanisms associated with crystalline solids along with material testing. This course also covers phase diagram, phase transformations and processing of Iron-carbon system.
8	Outline syllabus	
	Unit 1	**Structure and Imperfections in Crystalline Solids**
	A	Binding forces and energies in solids, Unit 3ells, Metallic crystal structures, Density computations, Crystal structures, Crystallographic points, directions and planes
	B	Crystalline and non-crystalline materials, Point defects: Vacancies, Self-interstitials and Impurities in solids,
	C	Miscellaneous imperfections: Dislocations, Linear defects, Surface defects. Diffusion mechanisms and Factors that affect diffusion
	Unit 2	**Mechanical Properties of Metals**
	A	Concepts of stress and strain, Stress-strain behavior, Anelasticity, Elastic properties of materials, True stress-strain curve and Elastic recovery
	B	Safety factors, Characteristics of dislocations, Slip systems, Plastic deformation in polycrystalline materials
	C	Strengthening mechanisms in metals: Strain hardening, Solid solution strengthening and Hall-Petch strengthening, Ductile and Brittle fracture
	Unit 3	**Phase Diagrams**
	A	Solubility limit, Phases, Microstructure, Phase equilibria and Unary phase diagram
	B	Binary phase diagrams: Interpretation of phase diagram, Development of

		microstructure in Isomorphous and eutectic systems and Gibbs phase rule.		
	C	Iron-Carbon system: Iron-Iron carbide phase diagram, Development of microstructure and influence of other alloying elements		
	Unit 4	**Phase Transformations**		
	A	Kinetics of phase transformations: Homogenous and heterogeneous nucleation and Growth, Metastable and Equilibrium states		
	B	Isothermal transformation diagrams, Athermal transformation and Continuous cooling transformation diagram		
	C	Mechanical behavior of Iron-Carbon alloys: Pearlite, Spheroidite, Banite and Martensite, Tempered martensite and Temper embrittlement		
	Unit 5	**Processing of Metal Alloys and Materials Testing**		
	A	Ferrous and Non-ferrous alloys: Composition, Mechanical properties and Applications		
	B	Concept of lower critical and upper critical temperature, Annealing processes: Process annealing, Stress relief, Annealing of ferrous alloys: Normalizing, Full anneal and Spheroidizing		
	C	Hardness test, Tensile test, Impact test, Significance of fatigue and creep properties, Fatigue test and Creep test		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	**Materials Science and Engineering an Introduction** by William D. Callister and David G. Rethwisch		
	Other References	**Materials Science and Engineering: A First Course** by V. Raghavan		

School: SET		**Batch :** 2021-2022
Program:		**Academic Year:** 2021-2022
Branch: ME		**Semester:** III
1	Course Code	**ARP203**
2	Course Title	**Logical Skills Building and Soft Skills**
3	Credits	2
4	Contact Hours (L-T-P)	1-0-2
	Course Status	Active
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	After completion of this course, students will be able to: CO1: Ascertain a competency level through Building Essential Language and Life Skills CO2: Build positive emotional competence in self and learn GOAL Setting and SMART Goals techniques CO3: Apply positive thinking, goal setting and success-focused attitudes which would help them in their academic as well as professional career CO4: Acquire satisfactory competency in use of aptitude, logical and analytical reasoning CO5: Develop strategic thinking and diverse mathematical concepts through building number puzzles CO6: Demonstrate an ability to apply various quantitative aptitude tools for making business decisions
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 : 2021-2022
Program:		Academic Year: 2021-2022
Branch: Mechanical Engineering (B. Tech.)		Semester: III
1	Course Code	MEC234
2	Course Title	Research Methodology
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Compulsory
5	Course Objective	• To develop understanding of the basic framework of research process. • To develop an understanding of various research designs and techniques. • To identify various sources of information for literature review and data collection. • To develop an understanding of the ethical dimensions of conducting applied research. • Appreciate the components of scholarly writing and evaluate its quality.
6	Course Outcomes	CO1: Infer the mind-set of a researcher CO2: Design a research plan CO3: Apply different methods for data collection CO4: Analyze the collected data CO5: Compile relevant data and prepare a report CO6: Infer the process of research right from inception of idea to execution and documentation.
7	Course Description	The course aims to develop a research orientation among the scholars and to acquaint them with fundamentals of research methods. Specifically, the course aims at introducing them to the basic concepts used in research and to scientific social research methods and their approach. It includes discussions on sampling techniques, research designs and techniques of analysis.
8	Outline syllabus	
	Unit 1	**Introduction**
	A	Introduction to research – The role of research, research process overview
	B	Philosophies and the language of research theory building – Science and its functions, What is theory?, and The meaning of methodology
	C	Thinking like a researcher – Understanding Concepts, Constructs, Variables, and Definitions
	Unit 2	**Research Problem and Hypotheses**
	A	Defining the research problem, The importance of problems
	B	Formulation of the research hypotheses, The importance of hypothesis

	C	Experimental and Non-experimental research design		
	Unit 3	**Data Collection**		
	A	Field research, and Survey research		
	B	Methods of data collection– Secondary data collection methods		
	C	Methods of data collection– qualitative methods of data collection, and Survey methods of data collection		
	Unit 4	**Data Analysis**		
	A	Attitude measurement and scaling – Types of measurement scales; Questionnaire designing – Reliability and Validity		
	B	Sampling techniques – The nature of sampling, Probability sampling design, Non-probability sampling design, Determination of sample		
	C	Processing and analysis of data		
	Unit 5	**Report Writing**		
	A	Ethical issues in conducting research		
	B	Report generation and report writing		
	C	APA format – Title page, Abstract, Introduction, Methodology, Results, Discussion, References, and Appendices		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• Chawla, Deepak & Sondhi, Neena (2011). Research methodology: Concepts and cases, Vikas Publishing House Pvt. Ltd. Delhi • Bryman, Alan & Bell, Emma (2011). Business Research Methods (Third Edition), Oxford University Press.		
	Other References	• Kerlinger, F.N., & Lee, H.B. (2000). Foundations of Behavioural Research (Fourth Edition), Harcourt Inc. • Rubin, Allen & Babbie, Earl (2009). Essential Research Methods for Social Work, Cengage Learning Inc., USA.		

School: SET		**Batch: 2021-2025**
Program: B. Tech		**Current Academic Year: 2021**
Branch: ALL		**Semester: III**
1	Course Code	MEP230
2	Course Title	CAD modelling through solid works Laboratory
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Compulsory
5	Course Objective	The objective of this introductory course is to make students familiar with computer-aided design, introduce them about the basic commands, tools and dimension techniques for creation and presentation of various engineering part model by using Solidworks 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: explain the fundamental features of Solidworks workspace and user interface. CO2: Apply the sketch tools such as draw, edit, and view for creating two-dimensional engineering drawings in Solidworks. CO3: Choose advance features to present a 3D part model in Solidworks. CO4: Creating assembly drawings from the part models. CO5: Generating views and projections from a 3d part model. CO6: read an engineering drawing and use the software packages for drafting and modeling.
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 and modelling. Using the current version of the Solidworks software, students will learn a variety of 3D part model creation techniques and be able to assemble them for in multiple perspectives. The pinnacle of the class is to empower and enable students to create using the software provided. Career opportunities in 3D 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 Solidworks and its interface
	Experiment 2	Working with Sketch Entities and Tools – Inference line, Centerline line, Line, Circle, Arc, Ellipse, Rectangle, Slots, Polygon, Ellipse, Partial Ellipse, Spline, Points, Text, Construction geometry, Fillet, Chamfer, Offset, convert entities, Trim, Extend, Mirror, Dynamic Mirror, Move, Copy, Rotate, Scale, Stretch, Sketch pattern

	Experiment 3	Adding Sketch Relation, Automatic relations, Smart Dimensioning.		
	Experiment 4	Creating of Part Features using Extrude, Revolve, Sweep and Loft		
	Experiment 5	Creating Advance Part Features like Fillet, Inserting Hole types, Chamfer and Shell		
	Experiment 6	Creating Rib and Pattern		
	Experiment 7	Introduction to Assembly Modeling & Approaches – Top down and Bottom up Approach.		
	Experiment 8	Applying Standard Mates- Coincident, Parallel, Perpendicular, Tangent, Concentric, Lock, Distance, Angle.		
	Experiment 9	Generating drawing and Creating Explode Views		
	Experiment 10	Creating views relative to model, Inserting predefined views, Auxiliary Views, Detailed Views, Crop view, Broken –Out Section, Broken Views, Section View, Alternate Position View, Drawing properties.		
	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	Solid works		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: Mechanical Engineering		**Semester: IV**
1	Course Code	MEP255
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 method and 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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: Mechanical Engineering		**Semester: III**
1	Course Code	MEP233
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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: MECH		**Semester: 3rd**
1	Course Code	**MEP231**
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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch: Mechanical Engineering		**Semester: IV**
1	Course Code	MEC 221
2	Course Title	Manufacturing Technology-II
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
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: select of different characteristics of 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: Design and select the tools in different circumstances and understand machinability as well as economics of machining CO6: Demonstrate knowledge of 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		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. 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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: MECH		**Semester: 4**
1	Course Code	**MEP232**
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: 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch: ME		**Semester:**
1	Course Code	MEC237
2	Course Title	Introduction to Thermal Engineering-II
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1) To comprehend the fundamentas of thermodynamics and be able to apply the same in Thermal Systems 2) Understand and analyse the Refrigertion Systems
6	Course Outcomes	After completion of this course, students will be able to: CO1: apply first law to simple thermodynamic systems. CO2: apply the concepts of entropy to simple thermodynamic systems CO3: determine the efficiency of various simple thermodynamic cycles CO4: calculate simple refrigeration cycles CO5: make simple pshychrometric calculations CO6: Recommend a Refrigeration System.
7	Course Description	The course teaches Thermodynamics and various Refrigeration Systems.
8	Outline syllabus	
	Unit 1	**Energy and first law**
	A	Thermodynamic properties and state, cycles, systems and processes, Path and point functions, Thermodynamic equilibrium,
	B	Zeroth law, Thermometry. First law applied to closed systems and in various process
	C	1st law of thermodynamic for steady flow process.Application of 1st law thermodynamics
	Unit 2	**Second law**
	A	Kelvin-Planck and Clausius statements,Heat engines and heat pumps, Efficiency and COP
	B	Carnot Engine and Carnot cycle
	C	Clausius Inequality, Principle of entropy, Available energy, Availability.
	Unit 3	**Steam properties and thermodynamic cycle. Psychrometry**
	A	Steam generation, 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.
	Unit 4	**Refrigeration**
	A	Refrigeration by non-cyclic process, vapour Compression Refrigeration Cycle
	B	Performance and Capacity of a vapour Compression Plan, Psychrometry, Heat load estimation

	C	Actual Vapour Compression Cycle, Components in a Vapour Compression Plant			
	Unit 5	**Refrigeration Applications**			
	A	Multi-stage Vapour Compression Systems, Refrigerants,			
	B	Absorption Refrigeration Cycle, Claude System of Air Liquefaction, Production of Solid Ice			
	C	New technologies in refrigeration.			
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		30%	20%	50%	
	Text book/s*	Engineering Thermodynamics: P.K.Nag Thermal Engineering: R.K.Rajput			

School: SET		Batch: 2021-2025
Program: B.Tech		Current Academic Year: 2021-2022
Branch: Mechanical Engineering		Semester: IV
1	Course Code	MEC238
2	Course Title	Mechanics of Machines
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	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 teach the basics of synthesis of simple mechanisms. 3. To teach students the kinematic analysis of cam-follower motion and gear train configurations. 4. To understand the concepts of turning moment diagrams, flywheel design, and the dynamics of reciprocating engines. 5. To understand the balancing procedures for rotating and reciprocating masses, rotors, and engines. 6. To provide students an understanding of different types of governors and the effect of gyroscopic couples in various vehicles
6	Course Outcomes	After the successful completion of the course students will be able to: CO1: Perform the position, velocity and acceleration analysis of planar mechanisms using various graphical techniques. CO2: Formulate the dimension synthesis of simple linkage mechanisms and construct the various cam profiles for specified motions of followers CO3: Apply the principles of the gear profiles and analyze the various gear trains. CO4: Perform the dynamic force analysis of machines such as engines and punching machine. CO5: Apply principles of balancing in machines and control systems such as gyroscopes and governors. CO6: Formulate and analyze the linkage and cam-follower systems using graphical and analytical techniques.
7	Course Description	This course introduces students to involve in kinematics and dynamics 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 centers' theorem and basic mathematics such as vector algebra, graphical techniques, and Chebychev equations are applied to synthesize and analyze feature of the simple mechanisms which simulates the motions of

		various machines. Further, the course describes the requirement of balancing of the rotor in a single and two planes under static and dynamic conditions		
8	Outline syllabus			
	Unit 1	**Kinematic Analysis of plane mechanisms**		
	A	Mechanisms & Machines, Kinematic pairs, Kinematic chains and their classification, Kinematic Inversions of four-link planar mechanisms and mobility		
	B	Aronhold Kennedy's theorem, Velocity analysis of simple four-bar mechanisms using Instantaneous Centres.		
	C	Velocity and Acceleration Analysis of Four bar and crank slider & their inversions only (Graphical)		
	Unit 2	**Synthesis of Linkages and Cam follower mechanisms**		
	A	Types of dimension synthesis, Function Generation (Four bar mechanisms): Fruedenstein's Analytical method using Cheybychev's Spacing		
	B	Classification of followers and Cams, Description of follower movements, Analysis of follower motion.		
	C	Synthesis of radial cam profile (Graphical Approach)		
	Unit 3	**Gears mechanisms 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 4	**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 the crankshaft		
	B	Equivalent offset inertia force. Engine force analysis including inertia of connecting rod.		
	C	Turning moment on the crankshaft, turning moment diagrams-single cylinder double acting steam engine, four-stroke IC engine and multi-cylinder steam engine, fluctuation of energy, flywheel.		
	Unit 5	**Balancing of machines and motion control**		
	A	Balancing of several rotating masses in the different planes. Partial balancing of two-cylinder locomotives, the variation of tractive force, swaying couple, hammer blow.		
	B	Terminology, centrifugal governors-Watt governor, Deadweight governors-Porter & Proell governor, Sensitivity, Stability, Hunting, Isochronism.		
	C	Principles of gyroscopic torque. Effect of gyroscopic couple on the stability of airplanes and ships		
	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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: ALL		**Semester: IV**
1	Course Code	MEP238
2	Course Title	Mechanics of machines 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: Classify the mechanisms used in the mechanical systems based on their kinematics. CO2: Analyze and select centrifugal governors based on the requirement and their characteristics. CO3: Demonstrate the gyroscopic effects in ships, aero-planes and road vehicles. CO4: Analyze balancing of masses in machinery. CO5: Demonstrate free and forced vibrations of single degree freedom systems CO6: Evaluate frequencies and modes of vibration of two rotor system.
7	Course Description	The course covers the procedures needed to develop the concepts related to precision measurement, inspection and analysis of dynamic behavior of system
8	Outline syllabus	
	List of Experiments	
	Experiment 1	To perform experiment to study and classify the mechanisms suitable for synthesizing machines.
	Experiment 2	To perform experiment on watt governor to prepare performance characteristics curve
	Experiment 3	To perform experiment on Porter governor to prepare performance characteristics curve
	Experiment 4	To perform experiment on Proell governor to prepare performance characteristics curve
	Experiment 5	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 6	To obtain balancing mass for the rotating mass system.
	Experiment 7	To study the longitudinal vibrations of helical spring and to determine the frequency or period of vibration (oscillation) theoretically and actually by experiment.
	Experiment 8	To determine the radius of gyration of compound pendulum using free vibration

		technique and compare with theoretical value.		
	Experiment 9	To study the free vibration and to determine the natural frequency of vibration of two-rotor system.		
	Experiment 10	To study whirling phenomenon in shaft and observe various modes of Vibrations under fixed end condition		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	Handouts given by the instructor		
	Software	-		

School: SET		**Batch :** 2021-2022
Program:		**Academic Year:** 2021-2022
Branch: ME		**Semester:** IV
1	Course Code	**ARP204**
2	Course Title	**Quantitative and Qualitative Aptitude Skill Building**
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 2nd phase of employability enhancement and skill building activity exercise.
6	Course Outcomes	After completion of this course, students will be able to: CO1: Develop and deliver the effective presentations to interpret the deeper meaning of life. CO2: Improve listening skills so as to understand complex business communication in a variety of global English accents through proper pronunciation CO3: Demonstrate a good understanding of effective business writing and telephone handling Skills CO4: Acquire higher level competency in use of aptitude, logical and analytical reasoning CO5: Develop higher level strategic thinking and diverse mathematical concepts through building number puzzles CO6: Demonstrate higher level quantitative aptitude tools for making business decisions
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 & STAR 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-Kinesthetics, 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 : 2021-2025
Program: B.Tech		Current Academic Year: 2021-2022
Branch: Mechanical Engineering		Semester: V
1	Course Code	MEC 331
2	Course Title	Machine Design
3	Credits	4
4	Contact Hours (L-T-P)	3-1-0
	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: Explain detail procedure, theory of failure and use of factor of safety in design of machine element CO2: Apply concept of stress concentration, Notch sensitivity and Goodman-Soderberg criteria for design of component CO3: Examine stress and design shaft and key in various load situation CO4:Evaluate stress and design riveted joint, bolted joint and springs under various load condition CO5: Evaluate various load in bearing, select suitable bearing and calculate various design parameter of bearing. CO6: Analyse the stresses and strains induced in a machine element.
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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: MECH		**Semester: 5**
1	Course Code	**MEP331**
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: 2021-2025
Program: B.Tech		Current Academic Year: 2021
Branch: ME		Semester: V
1	Course code	MEC339
2	Course Title	Production planning and Control
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
5	Course Objective	The objective of PPC is to equip the learner with the knowledge and skills necessary to be able to perform in one of the many disciplines associated with production and inventory management such as planning, Demand forecasting, Production planning and control inventory control, materials planning etc.
6	Course Outcomes	After successful completion of this course students should be able to: CO1. Identify the principles and applications relevant to Production and operations of manufacturing/service firms. CO2. Forecast situations in a production system environment that suggests the use of certain quantitative methods to assist in decision making. CO3. Explain how Enterprise Resource Planning and MRPII systems are used in managing operations. CO4. Plan and contribute to manufacturing and business operations. CO5. Demonstrate the managerial responsibility for Operations and inventory management. CO6. Apply planning, control, and inventory management in real-life complex problem
7	Outline syllabus	
7.01	**Unit 1**	**INTRODUCTION**
7.02	A	An Overview of production systems,
7.03	B	Production management objectives
7.04	C	Manufacturing strategy, Technological innovations in Manufacturing
7.05	**Unit 2**	**FORECASTING**
7.06	A	The forecasting process
7.07	B	Monitoring and controlling the forecasting system
7.08	C	multi-item forecasting
7.09	**Unit 3**	**PLANNINGACTIVITIES**
7.10	A	Aggregate Planning Strategies and methods
7.11	B	The Master Production Schedule,
ff7.12	C	Planning of material requirements-MRP, Manufacturing Resources Planning
7.13	**Unit 4**	**CONTROLACTIVITIES**
7.14	A	Capacity planning and control

7.15	B	Production Activity control,, Scheduling in Manufacturing,
7.16	C	Theory of constraints and synchronous manufacturing.
7.17	**Unit 5**	**INVENTORYMANAGEMENT and TQM**
7.18	A	Basic Inventory systems, Inventory systems under risk,
7.19	B	Distribution inventory management,
7.20	C	TQM basic concepts and application
8	Course Evaluation	
8.1	Course work:	30%
8.11	Attendance	None
8.12	Homework	Three best out of 4 assignments: 20 marks
8.13	Quizzes	Two 30-minutes surprise quizzes: 10 marks
8.14	Projects	None
8.15	Presentations	None
8.16	Any other	None
8.2	MTE	One, 20 percent
8.3	End-term examination: 50%	
9	References	
9.1	Text book	1. Lee J.Krajewski,Larry P.Ritaman," Operations Management ",Addison-Wesley,2000.
9.2	Other references	Reference Books and Monographs 1. Seetharama L.Narasimhan,Dennis W.McLeavy,Peter J .Billington, ." Producion planning and inventory control ", PHI. 2. Averetle E Adam, Jr Ronaald J. Ebert “Production and operational management, PHI 3. Elwood S Bufa and Rakesh K Sarin “ Modern Production/Operations Management”, Wiley India Edition, Reprint 2009 4. Shailendra Kale, “Production and Operations Management”, TMH Education,

School: SET		**Batch :** 2021-2022
Program:		**Academic Year:** 2021-2022
Branch: ME		**Semester: V**
1	Course Code	**ARP 301**
2	Course Title	**Personality Development and Decision making Skills**
3	Credits	2
4	Contact Hours (L-T-P)	1-0-2
	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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: ME		**Semester: V**
1	Course Code	MEP333
2	Course Title	Summer Internship II
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: Explain 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: Show 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 equipment's, 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 : 2021-2025
Program: B.Tech		Current Academic Year: 2021-2022
1	Course code	ECC301
2	Course Title	Community Connect
3	Credits	2
3.01	(L-T-P)	(0-0-2)
4	**Learning Hours**	Contact Hours: 60 Project/Field Work: 40 Assessment: 00 Guided Study: 20 Total hours: 60
5	**Course Objectives**	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.
6	**Course Outcomes**	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
7	**Theme**	**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** **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 : 2021-25
Program: B.Tech		Current Academic Year: 2021
Branch: Mechanical Engineering		Semester: V
1	Course Code	MEP360
2	Course Title	Automobile Engineering Lab - I
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	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	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 :** 2021-2022
Program:		**Current Academic Year:** 2021-2022
Branch: CSE		**Semester: VI**
1	Course Code	**ARP 302**
2	Course Title	**Campus to Corporate**
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 4th phase of employability enhancement and skill building activity exercise.
6	Course Outcomes	After completion of this course, students will be able to: CO1: Develop a creative resumes, cover letters, interpret job descriptions and interpret KRA and KPI statements and art of conflict management. CO2: Build negotiation skills to get maximum benefits from deals in practical life scenarios. CO3: Develop skills of personal branding to create a brand image and self-branding CO4: Acquire higher level competency in use of logical and analytical reasoning such as direction sense, strong and weak arguments CO5: Develop higher level strategic thinking and diverse mathematical concepts through building analogies, odd one out CO6: Demonstrate higher level quantitative aptitude such as average, ratio & proportions, mixtures & allegation for making business decisions.
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	Uploading & Curating Resumes in Job Portals, getting Your Resumes Noticed | Writing Cover Letters | 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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: ME		**Semester: VI**
1	Course Code	MEP433
2	Course Title	Summer Internship III
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: Explain 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: Show 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 equipment's, 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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch: ME		**Semester VI**
1	Course Code	MEP 397
2	Course Name	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 developing G and M codes for turning and Milling components. The students will have hands-on experience to generate automated tool paths for an engineering component.
6	Course Outcomes	CO1: Build 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. CO5: Construct 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 turning operation 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 interpolation for 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		
	Software	Handouts given by the instructor		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: MECH		**Semester: 6**
1	Course Code	**MEP332**
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%

School: SET		Batch : 2021-2025
Program: B.Tech		Current Academic Year: 2021-22
Branch: Mechanical Engineering		Semester: VII
1	Course Code	HMM305
2	Course Title	Management for Engineers
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 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	CO1: List the basic principles and concepts related to management in an organization 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: compare different types of organization and also using decentralization and span of control in organizations. CO4: Analyze jobs, recruitment process, manpower planning, job rotation, trainings and rewards in various 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, 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	Meaning, Importance and Principles		
	B	Departmentalization, Span of Control		
	C	Types of Organization, Authority, Delegation of Authority		
	Unit 4	Staffing		
	A	Meaning, Job analysis		
	B	Manpower planning, Recruitment, Transfers and Promotions		
	C	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*	1. Principles & practice of Mgmt., L.M. Prasad		
	Other References	1. Management Today, Burton & Thakur 2. Principles & Practices of Mgmt., C.B. Gupta 3. Understanding Management, Richard L.Daft 4. Management, Stoner, Freemand & Gilbert 5. Essential of Management, Koontz O' Donnel		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch: ME		**Semester: VI**
1	Course Code	MEC341
2	Course Title	Lean Production
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	
5	Course Objective	The Lean Production Course offers a practical introduction to lean management principles and techniques. The course is tailored to help the reader (s) implement lean manufacturing in business environment to improve productivity, business resilience, and to reduce waste.
6	Course Outcomes	After successful completion of this course students should be able to: CO1: label lean production and mass production CO2: Compare the process capacity and production system of different organization. CO3: Improve Workplace Visualization and maintaining continuous flow. CO4: Elaborate pull systems and scheduling. CO5: Recommend quality and continuous process improvement guidelines. CO6: Develop a resilient organization with minimum wastage
7	Course Description	Lean production focuses on improving the speed of a process and the elimination of waste, primarily by eliminating non-value-added steps. Lean production deals with the effectiveness with which a process meets customer requirements. The graduate course covers these topics with an emphasis on quantitative methods. Employers are increasingly looking for candidates trained in process engineering.
8	Outline syllabus	
	Unit 1	**INTRODUCTION: IDENTIFICATION OF WASTE**
	A	Understand the basic differences between lean production and mass production.
	B	Review the history of Lean Production, focusing on Japan's Toyota Production System as an alternative to mass production.
	C	waste impacts productivity and Taiichi Ohno’s famous 7 Wastes.
	Unit 2	**UNDERSTANDING FLOW: CAPACITY ANALYSIS**
	A	Basics of process analysis, process capacity and resource utilization, the important concepts of cycle time and takt time.
	B	The relationship between inventory, a waste and a flow time in a system through Little’s Law.
	C	Different types of production system
	Unit 3	**IMPROVING FLOW: WORKPLACE ORGANISATION AND VISUALIZATION**
	A	Introduction to the concepts of Workplace Visualization
	B	Organization and 5S for improving and maintaining continuous flow in Lean Production,
	C	The concept of Total Productive Maintenance
	Unit 4	**MAINTAINING FLOW: ESTABLISHING PULL SYSTEMS AND SCHEDULING**

	A	Define the key principle from the Toyota Production System, Just-In-Time (JIT)and the significance that JIT has for Lean Production in reducing waste and meeting customer demand.		
	B	Review of production planning and Production Scheduling		
	C	Mixed-Model Scheduling and Pull systems using Kanban, value stream mapping		
	Unit 5	**QUALITY AND CONTINUOUS IMPROVEMENT**		
	A	The impact of defects on flow rate and Poka Yoka		
	B	Kaizen Blitz for problem-solving and process improvements		
	C	The Toyota Way 2001, and Jeffrey Liker's 14 Management Principles.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Lean And Six Sigma – Six Sigma Black Belt (2007 BOK): Enterprise-Wide Deployment Paper Back by Suvabrata Mitra		
	Other References	1.Toyota Production System -An integrated approach to Just in Time – Yasuhiro Monden, – Engineering aild Management Press -Institute of Industrial Engineers – 1983 2. James P Womack, Daniel T Jones, and Daniel Roos, The Machine that changed the World. The Story of Lean Production -Harper Perennial edition published 1991 3. Gemba Kaizen: A Commonsense Approach to a Continuous Improvement Strategy, Second Edition Hardcover – 2012by Masaaki Imai 4. Value Stream Mapping : How to Visualize Work and Align Leadership for Organizational Transformation Paperback – 2016 by Karen Martin , Mike Osterling		

School: SET		**Batch : 2021-2025**		
Program: B.Tech		**Current Academic Year: 2021**		
Branch: ME		**Semester: VII**		
1	Course Code	**MEC 460**		
2	Course Title	**Major Project I**		
3	Credits	2		
4	Contact Hours (L-T-P)	0-0-4		
	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: Choose the literature to identify research gaps and define objectives CO3: Evaluate the feasibility of project. CO4: Develop and implement innovative ideas for social benefit. CO5: Create a prototype/models, experimental set up and software systems necessary to meet the objectives CO6: Compile the short report of literature survey and experimental work		
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 : 2021-2025**		
Program: B.Tech		**Current Academic Year: 2021**		
Branch: Mechanical Engineering		**Semester: VIII**		
1	Course Code	**MEC461**		
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 methodology to carry the experiments towards significant outcome. CO2: Construct the procedures with a concern for society, environment and ethics CO3: Analyze the prototype/model using the mathematical models equation CO4: Compare the results with optimization tools and also draw the valid conclusions CO5: Create a report as per the recommended format and defend the work. CO6: Develop 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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch: Mechanical Engineering		**Semester:**
1	Course Code	MEP 397
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 developing G and M codes for turning and Milling components. The students will have hands-on experience to generate automated tool paths for an engineering component.
6	Course Outcomes	CO1: Build 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. CO5: Construct 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	
	List of Experiments	
	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 turning operation 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 interpolation for 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		
	Software	Handouts given by the instructor		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch: ME with Automobile Engineering		**Semester: III**
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 system and 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.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch: ME		**Semester: IV**
1	Course Code	MEC 329
2	Course Title	Automotive Electric and Electronic
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	In this course, Students will be able to learn the mounting of electrical and electronics automotive parts in automobile and their functions and understanding of uses of batteries and their accessories even. Students will be able to learn the basics of electrical and electronics concept and also the use of sensors and activators.
6	Course Outcomes	The students will be able to: CO1: Analyze the efficiency of the batteries. CO2: Demonstrate the concept of Starting System CO3: Summarize the concept of Charging system, Lighting System, Wiper System. CO4: Recall the concept of Automotive Electronics CO5: Illustrate the details of Automotive Electricals. CO6: Define the concept of Sensors
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.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch: ME		**Semester: V**
1	Course Code	AUT306
2	Course Title	Electric Vehicle Technology
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 understand the operation of battery driven electric vehicle. This course initiates candidates into the emerging area of Electric Vehicles and helps learn the Basics of Battery driven Electric Vehicle and its Dynamics, Motors, Power Electronics, Batteries, Charging etc. The program consists of instructor led live lecture sessions and demonstrations.
6	Course Outcomes	The students will be able to: CO1: Explain the concept of Hybrid Electric Vehicle. CO2: Demonstrate the details of Electric drives. CO3: Design the various energy storage devices in electric vehicle. CO4: Explain the concept of Engine Mangement System. CO5: Apply the application of Connectors in Electric Vehicle. CO6: Create the idea of manufacturing the Electric Vehicle.
7	Course Description	The course will start with introduction section which will enable the students to understand the focus areas that come under the umbrella of electric vehicles. Then the course will start covering this focus areas one by one such as vehicle dynamics, Motors, Power Electronics, Batteries charging etc. The most important part of this course will be that each topic will be analyzed and demonstrated through Matlab Simulink, so that the grip of the subject will be strong and the knowledge acquired will be useable in real time applications.
8	Outline syllabus	
	Unit 1	**Introduction to Hybrid Electric Vehicle**
	A	Introduction to Hybrid Electric Vehicles: Types of EVs
	B	Hybrid Electric Drive-train
	C	Tractive effort in normal driving
	Unit 2	**Electric Drives**
	A	Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains.
	B	Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains, Electric Propulsion unit, Configuration and control of DC Motor drives.
	C	Induction Motor drives, Permanent Magnet Motor drives, Switches reluctance motor.
	Unit 3	**Energy Storage**
	A	Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles:- Battery based energy storage and its analysis,
	B	Fuel Cell based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system.

	C	Design of Hybrid Electric Vehicle and Plug-in Electric Vehicle.		
	Unit 4	**Energy Management System**		
	A	Energy Management Strategies, Automotive networking and communication.		
	B	EV charging standards, V2G, G2V, V2B, V2H.		
	C	Business: E-mobility business, electrification challenges, Business- E- mobility business, electrification challenges.		
	Unit 5	**Mobility and Connectors**		
	A	Connected Mobility and Autonomous Mobility- case study Emobility Indian Roadmap Perspective. Policy: EVs in infrastructure system, integration of EVs in smart grid, social dimensions of EVs.		
	B	**Connectors-** Types of EV charging connector, North American EV Plug Standards, DC Fast Charge EV Plug Standards in North America		
	C	CCS (Combined Charging System), CHAdeMO, Tesla, European EV Plug Standards,		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Emadi, A. (Ed.), Miller, J., Ehsani, M., "Vehicular Electric Power Systems" Boca Raton, CRC Press, 2003		
	Other References	2. Husain, I. "Electric and Hybrid Vehicles" Boca Raton, CRC Press, 2010.		
		3. Larminie, James, and John Lowry, "Electric Vehicle Technology Explained" John Wiley and Sons, 2012		
		4. Tariq Muneer and Irene IllescasGarcía, "The automobile, In Electric Vehicles: Prospects and Challenges", Elsevier, 2017		

School: SET		**Batch : 2021-2025**
Program: B. Tech		**Current Academic Year: 2021-2022**
Branch: ME with Automobile Engineering		**Semester: VI**
1	Course Code	AUT307
2	Course Title	Automotive Chassis
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To gain the basic knowledge about the vehicle frame. 2. To help the students to identify the various type of steering systems. 3. To understand the different types of drive line and final drive. 4. To study the fundamental and working of different types of suspension systems, wheels and tyres. 5. To acquire the fundamental knowledge about the braking systems. 6. To enable the students to apply the knowledge of automotive chassis to develop modern vehicle parts.
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1: Possess the knowledge about various vehicle frames and vehicle sub systems CO2: Know the suitable steering system for different vehicles application. CO3: Familiarize the various axles and drive line systems for automobiles CO4: Evaluate the different type of suspension system and brake performances. CO5: Select suitable wheels and tires according to the application. CO6: Apply the fundamental knowledge to develop modern vehicle systems.
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	**CHASSIS LAYOUTS and FRAMES**
	A	Types of Chassis Layout with reference to Power Plant Location and Drive.
	B	Automotive Frames - Material Selection and its Constructional Details, Various types
	C	Different Loads acting on Frame, Testing of Automotive Frames.
	Unit 2	**STEERING SYSTEM**
	A	Types of Front Axles and Stub Axles, Front Wheel Geometry, Condition for True Rolling Motion of Wheels during Steering.
	B	Steering Mechanisms, Steering Error Curve, Steering Linkages, Different Types of Steering Gears
	C	Slip Angle, Over Steer and Under Steer, Reversible and Irreversible Steering, Power Assisted Steering.

	Unit 3	**DRIVE LINE**		
	A	Propeller Shaft - Design Considerations & Constructional Details, Universal Joints, Constant Velocity Joints.		
	B	Hotchkiss Drive, Torque Tube Drive, Radius Rods and Stabilizers, Final drive - Different types, Multiaxled Vehicles		
	C	Differential - Working Principle and Constructional Details, Non–Slip Differential, Differential Locks		
	Unit 4	**SUSPENSION SYSTEM**		
	A	Need for Suspension System, Types of Suspension Springs, Constructional details and Characteristics of Single Leaf, Multi Leaf, Coil		
	B	Constructional details and Characteristics of Torsion bar, Rubber, Pneumatic and Hydro – elastic Suspension Systems, Independent Suspension System		
	C	Shock Absorbers - Types and Constructional details.		
	Unit 5	**BRAKING SYSTEMS**		
	A	Stopping Distance, Braking Efficiency, Weight Transfer during Braking.		
	B	Drum Brakes - Constructional Details, Leading and Trailing Shoe, Braking Torque, Disc Brake - Types and Constructional Details, Relative advantages and disadvantages over Disc Brakes. Hydraulic Braking System.		
	C	Pneumatic Braking System, Power–Assisted Braking System, Servo Brakes, Retarders, Types and Construction.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	K.V James, D Halderman (2013) "Automotive Chassis Systems" 6th Edition, Prentice Hall Publisher.		
	Other References	1. James E Duffy (2011) "Modern Automotive Technology", Goodheart-Willcox; Seventh Edition. 2. Jack Erjavec (2009) "Automotive Technology – A systems approach", Cengage Learning. 3. William H. Crouse and Donald L. Anglin (2007) Automotive Mechanics, 10th edition.		

School: SET		**Batch : 2021-2025**
Program: B. Tech		**Current Academic Year: 2021-2022**
Branch: ME		**Semester: VII**
1	Course Code	AUT308
2	Course Title	Vehicle Dynamics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To make the students understand the fundamentals of vibration and its application in vehicles 2. To make the students understand the behaviour of tyres 3. To make the students learn about the stability of the vehicles 4. To make the students learn about the roll stability and vehicle handling characteristics.
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1: Evaluate the natural frequency of a single and multi-degree freedom systems CO2: Predict the stability of vehicle at different operating conditions CO3: Predict the behaviour of tyres during braking, acceleration and cornering CO4: Discuss the roll stability of a vehicle CO5: Analyse the directional stability of the vehicle during cornering CO6: Analyse the behaviour of the vehicles under acceleration, ride and braking
7	Course Description	This course prepares students to install, remove, maintain and repair this system in an automobile. This course introduces students to understand the principle and performance of vehicle in various modes such as longitudinal, vertical and lateral directions. At the end of the course the student will be able to identify the various forces and loads and performance under acceleration, ride and braking.
8	Outline syllabus	
	Unit 1	**PERFORMANCE CHARACTERISTICS of VEHICLE**
	A	SAE Vehicle axis system, Forces & moments affecting vehicle, Earth Fixed coordinate system.
	B	Dynamic axle loads, Equations of motion, transmission characteristics, vehicle performance, power limited.
	C	Traction limited acceleration, braking performance, Brake proportioning, braking efficiency.
	Unit 2	**TIRE MECHANICS**
	A	Tire Construction, Size and Load Rating, Terminology and Axis System, Tractive Properties, Cornering Properties, , Simple model for lateral slip.
	B	Camber Thrust, Aligning Moment, Combined Braking and Cornering, Conicity and Ply Steer, Slip, Skid, Rolling Resistance, Elastic Band Model for longitudinal slip
	C	Combined longitudinal/lateral slip (friction ellipse), Taut string model for lateral slip, Magic Tire Formula.

	Unit 3	**SUSPENSION and ROLL STABILITY**		
	A	Suspension Kinematics, Suspension types, Solid Axles, Independent Suspensions, Anti-Squat and Anti-Pitch Suspension Geometry, Anti-Dive Suspension Geometry,		
	B	Roll Center Analysis, Suspension Dynamics, Multi-body vibration, Body and Wheel hop modes, Invariant points.		
	C	Controllable Suspension Elements: Active, Semi-Active. Choice of suspension spring rate, Calculation of effective spring rate, Vehicle suspension in fore and apt directions.		
	Unit 4	**VEHICLE HANDLING**		
	A	The Steering Linkages, Steering System Forces and Moments, Steering System Models, Steering Geometry, Steady Handling (2 DOF steady-state model).		
	B	Understeer and Oversteer, Effect of Tire Camber and Vehicle Roll (3 DOF steady-state model), Transient Handling and Directional Stability (2 DOF unsteady model).		
	C	Effect of Vehicle Roll on Transient Handling (3 DOF unsteady model), Steady-State and Transient Handling of Articulated Vehicles.		
	Unit 5	**MOTORCYCLE DYNAMICS**		
	A	Kinematic structure of motorcycle, geometry of motorcycles, importance of trail.		
	B	Resistance forces acting on motorcycle (tyre rolling resistance, aerodynamic resistance forces, resistant force caused by slope).		
	C	Location & height of motor cycle's centre of gravity (C.G), Moments of inertia on Motorcycle. Introduction to Front & Rear suspensions of Motorcycle.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Rao V. Dukkipati, Jian Pang, "Road Vehicle Dynamics problems and solution",SAE,2010.		
	Other References	1. Thomas D.Gillespie, "Fundamentals of vehicle dynamics",SAE,1992 2. J.G. Giles, "Steering, Suspension and Tyres", Illiffe Books Ltd., 1968. 3. J. Y. Wong, "Theory of Ground Vehicles", John Wiley and Sons Inc., New York, 2001.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: ME		**Semester: III**
1	Course Code	MEC310
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: Understanding the concepts of design of mechatronics elements. CO5: Realize the concepts of real time interfacing and data acquisition 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	Introduction, Key elements, Integrated Design Issues in Mechatronics
	B	Mechatronics design process, Mechatronics and traditional design
	C	Applications in Mechatronics: Condition Monitoring, Monitoring On-Line, Model-Based Manufacturing, Supervisory Control Structure, Opt mechatronics, Mechatronic Systems in Use
	Unit 2	**Basic system modelling**
	A	Introduction, Operator Notation and Transfer Functions, Block Diagrams, Manipulations, and Simulation
	B	Block Diagram Modelling—Direct Method, Analogy Approach and Modified Analogy Approach
	C	Mathematical modelling : Basic system modelling of mechanical, electrical, fluid and thermal system
	Unit 3	**Mechatronic system modelling and Controllers**
	A	Engineering systems: Rotational-translational and electro-mechanical system
	B	Engineering systems: Pneumatic-mechanical, hydraulic-mechanical
	C	Control modes, Adaptive control system, Programmable logic controllers
	Unit 4	**Sensors and Transducers**

	A	Sensor Classification, Parameter Measurement in Sensors and Transducers, Quality Parameters, Errors and Uncertainties in Mechatronic Modelling Parameters		
	B	Sensors for Motion and Position Measurement, Digital Sensors for Motion Measurement, Force and Torque Sensors		
	C	Vibration—Acceleration Sensors, Sensors for Flow Measurement, Temperature Sensing Devices and Sensor Applications		
	Unit 5	**Actuating Devices and Real time interfacing**		
	A	Mechanical Actuators, Electrical Actuators and Pneumatic Actuators		
	B	Fluid Power Actuation, Fluid Power Design Elements and Piezoelectric Actuators		
	C	Elements of a Data Acquisition and Control System, Devices for Data Conversion and Data Conversion Process		
	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 : 2021-2025
Program: B.Tech		Current Academic Year: 2021
Branch: Mechanical Engineering		Semester: IV
1	Course Code	ECE092
2	Course Title	Control System Engineering
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Department Elective
5	Course Objective	1. To introduce the components and their representation of control systems 2. To learn various methods for analyzing the time response, frequency response and stability of the systems. 3. To learn the various approach for the state variable analysis.
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: Measure the performance of simple feedback controllers and compensators to meet desired specifications CO6: Able to solve the state equation of a control system
7	Course Description	The objective of this course is to introduce different types of system and identify a set of algebraic equations to represent and model a complicated system into a more simplified form to interpret different physical and mechanical systems in terms of electrical system to construct equivalent electrical models for analysis. Employment of time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions and identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system. Formulation of different types of analysis in frequency domain to explain the nature of stability of the system.
8	Outline syllabus	

	Unit 1	**SYSTEMS COMPONENTS AND THEIR REPRESENTATION**		
	A	Control System: Terminology and Basic Structure-Feed forward and Feedback control theory		
	B	Electrical and Mechanical Transfer Function Models-Block diagram Models		
	C	Signal flow graphs models-DC and AC servo Systems, Synchros -Multivariable control system		
	Unit 2	**TIME REPONSE ANALYSIS**		
	A	Transient response-steady state response-Measures of performance of the standard first order and second order system		
	B	Effect on an additional zero and an additional pole-steady error constant and system- type number		
	C	PID control-Analytical design for PD,PI,PID control systems		
	Unit 3	**FREQUENCY RESPONSE AND SYSTEM ANALYSIS**		
	A	Closed loop frequency response-Performance specification in frequency domain		
	B	Frequency response of standard second order system- Bode Plot - Polar Plot-Nyquist plots		
	C	Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation		
	Unit 4	**CONCEPTS OF STABILITY ANALYSIS**		
	A	Concept of stability-Bounded, Input Bounded, Output stability		
	B	Routh stability criterion, Relative stability		
	C	Root locus concept-Guidelines for sketching root locus-Nyquist stability criterion.		
	Unit 5	**CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS**		
	A	State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models		
	B	Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations		
	C	State variable analysis of digital control system-Digital control design using state feedback.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. M.Gopal, "Control System — Principles and Design", Tata McGraw Hill, 4th Edition, 2012.		
	Other References	1. J.Nagrath and M.Gopal, "Control System Engineering", New Age International Publishers, 5 th Edition, 2007. 2. K. Ogata, 'Modern Control Engineering', 5th edition, PHI, 2012. 3. S.K.Bhattacharya, Control System Engineering, 3rd Edition, Pearson, 2013. 4. Benjamin.C.Kuo, "Automatic control systems", Prentice Hall of India, 7th Edition,1995.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch: ME		**Semester: V**
1	Course Code	ECE093
2	Course Title	Digital Electronics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Department Elective
5	Course Objective	1. To present the Digital fundamentals, Boolean algebra and its applications in digital systems 2. To familiarize with the design of various combinational digital circuits using logic gates 3. To introduce the analysis and design procedures for synchronous and asynchronous sequential circuits 4. To explain the various semiconductor memories and related technology
6	Course Outcomes	CO1: Design and analyse combinational logic circuits CO2: Distinguish between modular combinational circuits with MUX/DEMUX, Decoder, Encoder CO3: Choose the different flip flops and convert them. CO4: Solve synchronous sequential logic circuits CO5: Select different programmable connections and FPGA implementation of logic functions. CO6: Compare different memory elements used in the electronics systems
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, analyze, verify, and troubleshoot digital circuits using appropriate techniques and test equipment.
8	Outline syllabus	
	Unit 1	**DIGITAL FUNDAMENTALS**
	A	Number Systems – Decimal, Binary, Octal, Hexadecimal, 1‘s and 2‘s complements
	B	Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates
	C	Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization
	Unit 2	**COMBINATIONAL CIRCUIT DESIGN**
	A	Design of Half and Full Adders, Half and Full Subtractors
	B	Binary Parallel Adder – Carry look ahead Adder, BCD Adder,
	C	Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder
	Unit 3	**SYNCHRONOUS SEQUENTIAL CIRCUITS**
	A	Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF
	B	Analysis and design of clocked sequential circuits – Design – Moore/Mealy models,

		state minimization, state assignment, circuit implementation		
	C	Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.		
	Unit 4	**ASYNCHRONOUS SEQUENTIAL CIRCUITS**		
	A	Stable and Unstable states, output specifications, cycles and races		
	B	State reduction, race free assignments, Hazards, Essential Hazards		
	C	Pulse mode sequential circuits, Design of Hazard free circuits.		
	Unit 5	**MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS**		
	A	Basic memory structure – ROM -PROM – EPROM – EEPROM –EAPROM, RAM – Static and dynamic RAM		
	B	Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using PLA, PAL.		
	C	Digital integrated circuits: Logic levels, propagation delay, power dissipation, fan-out and fan-in, noise margin, logic families and their characteristics-RTL, TTL, ECL, CMOS		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson, 2014		
	Other References	1. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013. 2. Thomas L. Floyd, "Digital Fundamentals", 10th Edition, Pearson Education Inc, 2011 3. S.Salivahanan and S.Arivazhagan"Digital Electronics", Ist Edition, Vikas Publishing House pvt Ltd, 2012. 4. Anil K.Maini "Digital Electronics", Wiley, 2014. 5. A.Anand Kumar "Fundamentals of Digital Circuits", 4th Edition, PHI Learning Private Limited, 2016. 6. Soumitra Kumar Mandal " Digital Electronics", McGraw Hill Education Private Limited, 2016.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch: Mechanical Engineering		**Semester: VI**
1	Course Code	MEC364
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: Make use of the actuator and impart knowledge on open loop and closed loop system CO2: Choose among the various units and standards used in measurement system CO3: Examine various types of resistive, inductive and capacitive transducers CO4: Determine the behaviour of smart and intelligent actuators CO5: Interpret amplification, filtering, signal conditioning and data logging of a system CO6: Minimize the measurement error associated with the instruments used in different industries
7	Course Description	This is a course on sensors and signal processing used for mechatronics engineer. The focus is on building knowledge and skills in several sensor network applications.
8	Outline syllabus	
	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	Generalized Measurement 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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch: Mechanical Engineering		**Semester: VII**
1	Course Code	MEC365
2	Course Title	Robotics and Machine Vision System
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Department Elective
5	Course Objective	1. To know about the principles and applications of vision system in modern manufacturing environment 2. To learn about the algorithms in vision 3. To know about the recognition of object 4. To be familiar about the applications regarding vision 5. To know about the components used for vision
6	Course Outcomes	CO1: Explain the gadgets and vision systems CO2: Select the image capturing and processing techniques CO3: Develop the vision system in other machines CO4: Knowledge for recognizing the objects based on sensors CO5: Application of vision and image processing in robot operations CO6: Apply the robotics and machine vision principles on real time industrial applications
7	Course Description	The objective of this course is to provide engineering students theoretical and practical experience with automation technologies that will be of prime importance over the next decade: data acquisition and instrumentation, machine vision and motion control. Future manufacturing engineers need to be aware of machine vision technology, so they can realize the opportunities to integrate this technology into other processes where it is not currently available. Describe the components of a machine vision Systems, their functions, and the various technological options available for them. Be familiar with the most common image processing algorithms used in industrial applications. Identify situations or systems that could be improved by the application of machine vision.
8	Outline syllabus	
	Unit 1	**VISION SYSTEM**
	A	Basic Components — Elements of visual perception
	B	Lenses: Pinhole cameras, Gaussian Optics
	C	Cameras — Camera-Computer interfaces
	Unit 2	**VISION ALGORITHMS**
	A	Fundamental Data Structures: Images, Regions, Sub-pixel Precise Contours

	B	Image Enhancement: Gray value transformations, image smoothing, Fourier Transform — Geometric Transformation		
	C	Image segmentation — Segmentation of contours, lines, circles and ellipses — Camera calibration — Stereo Reconstruction.		
	Unit 3	**OBJECT RECOGNITION**		
	A	Object recognition, Approaches to Object Recognition		
	B	Recognition by combination of views — objects with sharp edges, using two views only		
	C	Recognition by combination of views - using a single view, use of dept values.		
	Unit 4	**APPLICATIONS**		
	A	Transforming sensor reading, Mapping Sonar Data, Aligning laser scan measurements		
	B	Vision and Tracking: Following the road, Iconic image processing, Multiscale image processing		
	C	Video Tracking - Learning landmarks: Landmark spatio grams, K-means Clustering, EM Clustering.		
	Unit 5	**ROBOT VISION**		
	A	Basic introduction to Robotic operating System (ROS) - Real and Simulated Robots		
	B	Introduction to OpenCV, Open NI and PCL		
	C	Installing and testing ROS camera Drivers, ROS to OpenCV - The cv_bridge Package.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Carsten Steger, Markus Ulrich, Christian Wiedemann, "Machine Vision Algorithms and Applications", WILEY-VCH, Weinheim,2008. Damian m Lyons, "Cluster Computing for Robotics and Computer Vision", World Scientific, Singapore, 2011.		
	Other References	1. Rafael C. Gonzalez and Richard E.woods, "Digital Image Processing", Addition - Wesley Publishing Company, New Delhi, 2007. 2. Shimon Ullman, "High-Level Vision: Object recognition and Visual Cognition", A Bradford Book, USA, 2000. R.Patrick Goebel, " ROS by Example: A Do-It-Yourself Guide to Robot Operating System —Volume I", A Pi Robot Production, 2012.		

School: SET		Batch : 2021-25
Program: B.Tech		Current Academic Year: 2021-22
Branch: Mechanical Engineering		Semester: VI
1	Course Code	MEC433
2	Course Title	I C 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	At the end of the course, the student will be able to: 1. Demonstrate the ability to perform a thermodynamic analysis of Otto, Diesel, and Dual cycle models. 2. Explain the characteristics of common liquid and gaseous fuels with the ability to perform a combustion analysis of these fuels in the basic cycles. 3. Examine the characteristic of homogeneous combustion in SI-Engines and spray combustion in CI-Engines. 4. Improve the performance parameters of CI-Engines 5. Analyze different ignition system, fuel injection systems, lubrication systems, supercharging and its effect. 6. 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 1	**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. 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 : 2021-25**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch: ME		**Semester: VI**
1	Course Code	MEC356
2	Course Title	Refrigeration & Air Conditioning
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
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: 1. Explain the working principle of reverse Carnot Cycle, Air refrigeration systems and classify various air refrigeration cycles. 2. Identify the various factors affecting the working and COP of vapour compression system and explain the need of multistage vapour compression system. 3. Distinguish between the vapour compression and vapour absorption system working and characterize different refrigerants 4. Analyse psychometric processes and design air conditioning systems for various applications. 5. Explain different refrigeration & air conditioning equipment 6. Formulate and analyse the COP of refrigeration and air conditioning systems
7	Course Description	This course focus on the different methods of refrigeration and air conditioning, thermal comfort conditions, psychometry, its application in air conditioning and the understanding of heat transfer in buildings and duct designing.
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, Open and closed air refrigeration cycles,		
	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, Different configurations of multistage vapour compression system with removal of flash gas & Intercooling, Cascade system		
	Unit 3	**Vapour Absorption system**		
	A	Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures		
	B	Water vapour absorption system, Lithium- Bromide water vapour absorption system, Three fluid absorption system		
	C	Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free 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), Thermal analysis of human body,		
	C	Effective temperature and comfort chart, Infiltration & ventilation, Basic difference between comfort and industrial air conditioning.		
	Unit 5	**Refrigeration Equipment & Application**		
	A	Elementary knowledge of refrigeration & air conditioning equipments: compressors, condensers, evaporators & expansion devices		
	B	Air washers, Cooling towers, Ice plant, Water coolers		
	C	Elementary knowledge of transmission and distribution of air through ducts and fans		
	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	1. Prasad Manohar, Refrigeration and Air Conditioning, New Age Publication. 2. Stoecker, W.F.; Jones, J.W., Refrigeration and Air conditioning, McGraw-Hill Publishing Company, 1982. 3. Dossat, Roy J., Principles of Refrigeration, Prentice Hall Publishing, 2001.		

School: SET		Batch : 2021-2025
Program: B.Tech		Current Academic Year: 2021
Branch: Mechanical Engineering		Semester: VII
1	Course Code	MEC 335
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 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 control manufacturing. 3. The students will get knowledge about the integration robot in flexible manufacturing systems. 4. The students will get some exposure to the Future of Automated Industry.
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: Analyze the assembly line balancing and Familiarize about the Flexible manufacturing system. CO3: Select the CAD/CAM tools and CNC in manufacturing processes. CO4: Plan the use of robotics in modern manufacturing. CO5: Apply the modern trends in Manufacturing like Industry 4.0 and applications of Toyota system leading to Smart Manufacturing. CO6: Explain the applications of computer in planning, manufacturing and controlling.
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, future of automation industry, product life cycle management, computer aided manufacturing, and Flexible manufacturing.
8	Outline syllabus	
	Unit 1	**Introduction and Automated Flow Line**
	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 balancing, methods of line balancing, Largest candidate rule and Ranked Positional Weights method of line balancing.		
	Unit 2	**Automated Material Handling and FMS**		
	A	The material handling function, Types of Material Handling Equipment, Conveyor Systems, Automated Guided Vehicle Systems.		
	B	Automated Storage Systems: Storage System Performance, Automated Storage/Retrieval Systems, Carousel Storage Systems		
	C	Flexible Manufacturing Systems, types of FMS, FMS components		
	Unit 3	**CAD and CAM**		
	A	Applications of computers in design, software configuration, functions of graphics package, 2D transformations and geometric modeling.		
	B	Introduction, components of CNC, CNC programming, manual part programming, G Codes and M Codes		
	C	Programming of simple components in turning and milling systems		
	Unit 4	**Robotics**		
	A	Robot anatomy, joints and links, common robot configurations.		
	B	Robot control systems, End effectors, Sensors in robotics		
	C	Industrial Robots, Applications of robots in material handling, processing and assembly and inspection.		
	Unit 5	**Future of Automated Industry**		
	A	Focus on Waste, Relationship of Waste to Profit, Lean manufacturing		
	B	Toyota Production System		
	C	Industry 4.0, functions, applications and benefits. Components of Industry 4.0		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	**Text Book** 1. Mikell Groover, (2015), Automation, Production Systems and Computer-Integrated Manufacturing, 4th. Ed., ISBN # 0-13-349961-8, Pearson, New Jersey		
	Other References	**Reference Books** 1. M.P. Groover, (2008), Automation Production systems and Computer Integrated manufacturing, Pearson, Education 2. T.C. Chang, R. Wysk and H.P. Wang, (2009), Computer aided Manufacturing, Third Edition, Pearson **Education Software: –** AutoCAD and Solidworks		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch: Mechanical Engineering		**Semester: VII**
1	Course Code	MEC357
2	Course Title	Introduction to Six Sigma
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	
5	Course Objective	The objective of this course is to focus managerial strategy of process improvement and variation reduction and to put six sigma concepts into perspective
6	Course Outcomes	After successful completion of this course students should be able to: CO1: Identify and know the aspects of quality in an organization. CO2: Explain the fundamentals and applications of statistics in an organization. CO3: Describe the concepts of six sigma CO4: Interpret how processes can be statistically controlled CO5: Classify and describe various six sigma tools. CO6: Define the process of implementing six sigma.
7	Course Description	To highlight its importance, as well as to present in-depth ideas on different methodologies, tools and techniques followed in implementing Six sigma in organization.
8	Outline syllabus	
	Unit 1	**INTRODUCTION**
	A	Definition of six sigma, Dimensions of Quality
	B	Quality Planning
	C	Quality costs - Analysis Techniques for Quality Costs, Quality control
	Unit 2	**APPLICATION OF SIX SIXMA**
	A	Industrial application and implementation of six sigma
	B	Challenges in implementing Six Sigma
	C	Mass production Vs lean production
	Unit 3	**PROCESS IMPROVEMENT USING SIX SIGMA**
	A	Continuous Process Improvement –PDSA & PDCA Cycle
	B	Application of Kaizen, benchmarking
	C	voice of customer, basic matrices
	Unit 4	**TOOLS OF SIX SIGMA**
	A	Hoshin Kanri, DMAIC, Value Stream Mapping (VSM)
	B	Application of Just in time, 5S, Kanban
	C	The seven Muda, Pareto chart, control charts
	Unit 5	**IMPLEMENTATION OF SIX SIGMA**
	A	Taguchi Quality curve and Taguchi Quality Loss Function
	B	Quality Function Deployment (QFD) – House of Quality, QFD Process
	C	Various case studies of Six sigma implementation
	Mode of	Theory

	examination			
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Six sigma handbook by pyzdek, McGraw Hill		
	Other References	1. The Six Sigma Black Belt Handbook | Third Edition | By Pearson 2. Introduction to Six Sigma 1st Edition 2016 by Dr Niaz Ahmed Siddiqui, New Age International (P) Ltd Publishers		

School: SET		**Batch : 2021-25**
Program: B.Tech		**Current Academic Year: 2021**
Branch:		**Mechanical Engineering**
1	Course Code	MEC358
2	Course Title	Material Characterization Techniques
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
5	Course Status	Elective
6	Course Outcomes	On successful completion of this course the students will be able to: CO1: Explain different terminologies associated with optical image formation; and describe sample preparation procedure and working of optical microscopes CO2: Summarise the properties, generation and detection of X-rays and its utilization in analysing a microstructure CO3: Describe principle, working and construction of an SEM along with sample preparation techniques required for capturing the microstructure effectively CO4: Describe principle, working and construction of a TEM along with sample preparation techniques required for capturing the microstructure effectively CO5: Explain the instrumentation and working principle of TGA, DSC and Raman spectroscopy CO6: Conduct, evaluate and analyse microstructural characterization
7	Course Description	The course covers the basic principles and techniques of X-ray diffraction, optical, scanning electron and transmission electron microscopy along with the sample preparation technique required for the microstructural analysis. The course also gives an overview of thermal and spectroscopic techniques.
8	Outline syllabus	
	Unit 1	**Optical Microscopy (OM)**
	A	Optical image formation, Resolution, Depth of Field and Depth of Focus, Light sources and condenser systems, Selection of objective lenses
	B	Sampling and sectioning, Mounting and grinding, Polishing and Etching methods, Reflection and absorption of light
	C	Bright field and dark field image contrast, Phase contrast microscopy, Working with digital images, Image interpretation and Utilization of OM in latest research papers
	Unit 2	**X-ray diffraction (XRD) Analysis**
	A	Properties of X-rays: Electromagnetic radiation, Continuous and characteristic spectrum, Absorption, Filters, Production and Detection of X-rays and Safety precautions
	B	Diffraction, Bragg's law, X-ray spectroscopy, Diffraction directions, Diffraction methods, Diffraction under non ideal conditions
	C	Concept of allowed and forbidden reflection, Indexing of cubic crystals, Use of XRD to analyse structure of polycrystalline aggregates: grain size, particle size, crystal quality and Utilization of XRD in latest research papers
	Unit 3	**Scanning Electron Microscopy (SEM)**
	A	Components of SEM, Beam focusing conditions, Inelastic scattering and Energy losses, Characteristics of X-ray images and Image contrast in backscattered electron images
	B	Factors affecting secondary electron emission, Secondary electron image contrast, Sputter coating and contrast enhancement and Fractography

	C	Principles of operation and construction, Ion beam-specimen interactions and Utilization of SEM in latest research papers		
	Unit 4	**Transmission Electron Microscopy (TEM)**		
	A	Wave properties of electrons, Resolution limitations, Lens aberrations, Comparative performance of SEM and TEM		
	B	Specimen preparation: Mechanical thinning, Electrochemical thinning, Ion milling, Sputter coating, Carbon coating and Replica methods		
	C	Working principle and the origin of contrast in TEM, Principle of reciprocity in electron optics, Scanning TEM and Utilization of SEM in latest research paper		
	Unit 5	**Thermal and Spectroscopic Techniques**		
	A	Thermo-gravimetric analysis (TGA): Introduction, Instrumentation, Working principle and utilization in latest research papers		
	B	Differential Scanning Calorimetry (DSC): Introduction, Instrumentation, Working principle and Utilization in latest research papers		
	C	Raman Spectroscopy: Introduction, Instrumentation, Working principle and Utilization in latest research papers		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• **Microstructural Characterization of Materials** by David Brandon and Wayne Kaplan • **Elements of X-ray Diffraction** by B. D. Cullity		
	Other References	• **Materials Characterization Techniques** by Sam Zhang, Lin Li and Ashok Kumar • **Scanning Electron Microscopy and X-Ray Microanalysis** by Joseph I. Goldstein et al.		

School: SET		**Batch : 2021-25**
Program: B.Tech		**Current Academic Year: 2021**
Branch:		**Mechanical Engineering**
1	Course Code	MEC358
2	Course Title	Material Characterization Techniques
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
5	Course Status	Elective
6	Course Outcomes	On successful completion of this course the students will be able to: CO1: Explain different terminologies associated with optical image formation; and describe sample preparation procedure and working of optical microscopes CO2: Summarise the properties, generation and detection of X-rays and its utilization in analysing a microstructure CO3: Describe principle, working and construction of an SEM along with sample preparation techniques required for capturing the microstructure effectively CO4: Describe principle, working and construction of a TEM along with sample preparation techniques required for capturing the microstructure effectively CO5: Explain the instrumentation and working principle of TGA, DSC and Raman spectroscopy CO6: Conduct, evaluate and analyse microstructural characterization
7	Course Description	The course covers the basic principles and techniques of X-ray diffraction, optical, scanning electron and transmission electron microscopy along with the sample preparation technique required for the microstructural analysis. The course also gives an overview of thermal and spectroscopic techniques.
8	Outline syllabus	
	Unit 1	**Optical Microscopy (OM)**
	A	Optical image formation, Resolution, Depth of Field and Depth of Focus, Light sources and condenser systems, Selection of objective lenses
	B	Sampling and sectioning, Mounting and grinding, Polishing and Etching methods, Reflection and absorption of light
	C	Bright field and dark field image contrast, Phase contrast microscopy, Working with digital images, Image interpretation and Utilization of OM in latest research papers
	Unit 2	**X-ray diffraction (XRD) Analysis**
	A	Properties of X-rays: Electromagnetic radiation, Continuous and characteristic spectrum, Absorption, Filters, Production and Detection of X-rays and Safety precautions
	B	Diffraction, Bragg's law, X-ray spectroscopy, Diffraction directions, Diffraction methods, Diffraction under non ideal conditions
	C	Concept of allowed and forbidden reflection, Indexing of cubic crystals, Use of XRD to analyse structure of polycrystalline aggregates: grain size, particle size, crystal quality and Utilization of XRD in latest research papers
	Unit 3	**Scanning Electron Microscopy (SEM)**
	A	Components of SEM, Beam focusing conditions, Inelastic scattering and Energy losses, Characteristics of X-ray images and Image contrast in backscattered electron images
	B	Factors affecting secondary electron emission, Secondary electron image contrast, Sputter coating and contrast enhancement and Fractography

	C	Principles of operation and construction, Ion beam-specimen interactions and Utilization of SEM in latest research papers		
	Unit 4	**Transmission Electron Microscopy (TEM)**		
	A	Wave properties of electrons, Resolution limitations, Lens aberrations, Comparative performance of SEM and TEM		
	B	Specimen preparation: Mechanical thinning, Electrochemical thinning, Ion milling, Sputter coating, Carbon coating and Replica methods		
	C	Working principle and the origin of contrast in TEM, Principle of reciprocity in electron optics, Scanning TEM and Utilization of SEM in latest research paper		
	Unit 5	**Thermal and Spectroscopic Techniques**		
	A	Thermo-gravimetric analysis (TGA): Introduction, Instrumentation, Working principle and utilization in latest research papers		
	B	Differential Scanning Calorimetry (DSC): Introduction, Instrumentation, Working principle and Utilization in latest research papers		
	C	Raman Spectroscopy: Introduction, Instrumentation, Working principle and Utilization in latest research papers		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• **Microstructural Characterization of Materials** by David Brandon and Wayne Kaplan • **Elements of X-ray Diffraction** by B. D. Cullity		
	Other References	• **Materials Characterization Techniques** by Sam Zhang, Lin Li and Ashok Kumar • **Scanning Electron Microscopy and X-Ray Microanalysis** by Joseph I. Goldstein et al.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch:		**Mechanical Engineering**
1	Course Code	MEC359
2	Course Title	Heat Treatment of Metals and Alloys
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
5	Course Status	Elective
6	Course Outcomes	On successful completion of this course the students will be able to: CO1: Explain the principle behind different heat treatment processes and its effect on the properties of the product CO2: Describe the significance of hardenability and quenchants; and carry out temperature measurement CO3: Compare and contrast different chemical heat treatment processes and surface hardening methods CO4: Make use of different TMT processes to obtain desired properties CO5: Evaluate the quality of the heat treated product CO6: Modify the properties of a component as per the requirement
7	Course Description	The course comprehensively covers almost every aspect of heat treatment processes; right from principle, mechanism, inspection and quality control to the cause and remedy of defects that might occur during the treatment. It is expected that the students will be able to tailor the mechanical properties of metals and alloys as per the need upon completion of this course.
8	Outline syllabus	
	Unit 1	**Heat Treatment Processes for Steels and Aluminium**
	A	Stress relieving, Annealing and its types, Spheroidizing, Normalizing, Hardening methods and Factors affecting hardening process
	B	Tempering: Structural changes, Effect of alloying elements, Temper brittleness and colours, Austempering, Martempering, Sub-zero treatment and Patenting
	C	Heat treatable and non-heat treatable aluminium alloys, Classification, Heat treatment of cast and wrought aluminium alloys
	Unit 2	**Hardenability, Quenchants and Temperature Measurement**
	A	Significance of hardenability, relationship of hardenability with transformation rates and Determination of hardenability, Factors affecting hardenability: Austenitic grain size, Carbon content and Alloying elements
	B	Removal of heat during quenching, Quenching media and Characteristics of quenchants
	C	Thermocouples: Thermocouple material and its selection criteria, Temperature measurement and calibration, Indirect methods of temperature measurement and Temperature control
	Unit 3	**Chemical Heat Treatment of Steels and Surface Hardening**
	A	Carburizing types: Pack, Liquid, Gas and Vacuum; Post carburizing heat treatments, Cyaniding and Carbonitriding

	B	Nitriding, Plasma nitriding, Salt bath nitrocarburizing, Boronizing, Chromizing and Toyota Diffusion (TD) process		
	C	Surface hardening types: Flame, Induction, Electron beam and Laser; Case depth measurement in steels		
	Unit 4	**Thermomechanical Treatment and Defects in Heat Treatment**		
	A	Classification, Controlled rolling, Hot-cold working, Ausforming, and Isoforming		
	B	Marstraining, Cryoforming, Preliminary TMT, Thermomechanical annealing and TMT of non-ferrous alloys		
	C	Low hardness and strength after hardening, Soft spots, Oxidation, Decarburizing, Overheating and Burning of steels; Distortion and Wrapping; Methods to reduce distortion and Treatment for stabilizing dimension		
	Unit 5	**Quality Control and Energy Economy in Heat Treatment**		
	A	Inspection: Steps, Objectives, Manner, Process, Types and Stages; Factors controlling quality, Quality control		
	B	Quality control in heat treatment: Product design, Heat treatment specifications, Material selection, Dimensional considerations, Selection and working of equipment and accessories; Inspection in heat treatment		
	C	Energy economy through: Material change, Heat treatment practice and Processing; Air pollution in heat treatment		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	**Heat Treatment Principles and Techniques** by T.V. Rajan, C.P. Sharma and Ashok Sharma		
	Other References	**Steel and Its Heat Treatment** by Karl-Erik Thelning		

School: SET		**Batch : 2021-2022**
Program: B. Tech.		**Current Academic Year: 2021**
Branch:		**Mechanical Engineering**
	Course Code	MEC360
2	Course Title	Advanced Engineering Materials
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
5	Course Status	Elective
6	Course Outcomes	On successful completion of this course the students will be able to: CO1: Explain the structure, properties, fabrication routes and applications of ceramics CO2: Summarise the structure, properties, fabrication routes and applications of polymers CO3: Describe the constituents, properties, fabrication routes and applications of composites CO4: Explain the structure, properties, synthesis routes and applications of nanomaterials and the challenges associated with it CO5: Describe the composition, properties, fabrication routes and applications of other emerging materials such as functionally graded materials, high entropy alloys and super alloys CO6: Analyse the problems and accordingly suggest materials for different applications
7	Course Description	This course will familiarize the students with the structure/composition, properties, processing and applications of various classes of engineering materials. The students will develop an understanding that for a particular application which kind of materials can be used and how its properties can be altered as per the requirement.
8	Outline syllabus	
	Unit 1	**Ceramics**
	A	Crystal structure, Silicate ceramics, Imperfections in ceramics, Diffusion in ionic materials, Ceramic phase diagram
	B	Fracture behaviour, Stress-strain curve, Mechanisms of plastic deformation, Types and applications of ceramics: Glasses, Refractories, Abrasives, cements etc.
	C	Fabrication and processing of glasses, glass-ceramics and clay product; Powder pressing and Tape casting
	Unit 2	**Polymers**
	A	Polymer molecule chemistry, Molecular configuration, Polymer types, Copolymers, Crystallinity and crystals in polymers, Defects and diffusion in polymeric materials
	B	Stress-strain behaviour, Fracture behaviour, Mechanical properties, Deformation behaviour and Factors affecting mechanical properties of polymers
	C	Crystallization, Melting, Glass-transition, Types and applications, Polymerization, Additives, Forming techniques, Fabrication of elastomers, fibres and films

	Unit 3	**Composites**		
	A	Principle of combined action, Matrix phase, Reinforcement, Rule of mixture, Large particle composite and Dispersion strengthened composites		
	B	Influence of fibre length, Elastic behavior and Tensile stress-strain behavior of continuous and aligned fibre composites, discontinuous and aligned fibre composites and discontinuous and randomly oriented fibre composites		
	C	Fabrication/processing, properties and applications of different types of composites		
	Unit 4	**Nanomaterials**		
	A	History and scope, Classification, Microstructure and Defects in Nanocrystalline Materials and Effect of Nano-dimensions on Materials Behaviour		
	B	Synthesis Routes: Bottom-Up Approaches, Top-Down Approaches and Consolidation of Nanopowders		
	C	Applications of nanomaterials, Comparison of composites and nanocomposites, Nanostructured Materials with High Application Potential, Concerns and Challenges of Nanotechnology		
	Unit 5	**Emerging Engineering Materials**		
	A	Functionally Graded Materials: Introduction, Composition, Fabrication, Properties and Applications		
	B	High Entropy Alloys: Introduction, Composition, Fabrication, Properties and Applications		
	C	Super Alloys: Introduction, Composition, Fabrication, Properties and Applications		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	• **Materials Science and Engineering an Introduction** by William D. Callister and David G. Rethwisch • **Textbook of Nanoscience and Nanotechnology** by B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Murday		
	Other References	**Materials Science and Engineering: A First Course** by V. Raghavan		

School: SET		Batch : 2021-2025
Program: B.Tech		Current Academic Year: 2021
Branch: Mechanical Engineering		Semester:
1	Course Code	MEC318
2	Course Title	Supply Chain Management
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	
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	After successful completion of this course students should be able to: CO1: explain basic terminology and supply chain operations in the context of today's business environment. CO2: design the supply chain networks. CO3: manage inventory effectively and planning policy, demand variability, forecasting and lead time on inventory level and cost. CO4: improve in transportation and logistics in supply chain operations. CO5: perceive the importance of strategic supply chain alliances and the impact of information Technology in SCM. CO6: develop supply chain which is financially and environmentally sustainable
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*	2. Chopra, Sunil; Meindl Peter and Kalra Dharam vir; Supply chain Management, Pearson Publcation		
	Other References	1. Scharj, P.B., Lasen,T.S., Managing the global supply chain, Viva books, New Delhi, 2000. 2. Ayers, J.B., Hand book of supply chain management, The St.Lencie press, 2000. 3. Nicolas, J.N., Competeive manufacturing management-continuous improvement, Lean production, customer focussed quality, McGraw Hill, NY, 1998. 4.. Steudel, H.J. and Desruelle, P., Manufacturing in the ninetees-How to become a mean , lean and world class competitor, Van Nostrand Reinhold, NY, 1992.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch: ME		**Semester: VII**
1	Course Code	MEC334
2	Course Title	Introduction to Robotics Engineering
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Department 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	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: Modify 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: Choose 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
	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, gripping forces RCC and design features of grippers.
	Unit 3	**Robotic vision systems**
	A	Robot sensors, different types of contact and non-contact 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/unloading, inspection		
	C	Welding, spray painting and finish coating, and assembly, etc.		
	Unit 5	**Economy and safety related with robots**		
	A	Economic performance and evaluation strategies.		
	B	Robot installation and planning.		
	C	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: 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch:		**Mechanical Engineering**
1	Course Code	MEC361
2	Course Title	Hydraulic Machines
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Elective
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 be in a position to evaluate the performance characteristics of hydraulic turbines
6	Course Outcomes	CO1: Define the concepts of dynamics of fluid flow and the forces exerted by a jet of fluid on vanes. CO2: Explain construction features and working principles of different hydraulic turbines. CO3: Develop the concept of Centrifugal pumps. CO4: Design the reciprocating pump. CO5: Elaborate the concepts of various hydraulic machines. CO6: Build the concepts of various hydraulic turbines and pumps.
7	Course Description	The objective of this course 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 equipments used in practice
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
	A	Classification: Impulse and Reaction turbine, pelton wheel turbine and its components
	B	Reaction turbines: introduction and classification of reaction turbines, difference between impulse & reaction, discharge, power produced, work done, efficiencies, francis turbine and Kaplan turbine
	C	Draft tubes, unit quantities, specific speed, selection of turbine based on specific speed and head of water
	Unit 3	**Centrifugal Pump**
	A	Centrifugal pumps: classification, working principle

	B	Manometric head, efficiencies, discharge, power required to drive centrifugal pump		
	C	Specific speed of CP, selection of pumps based on specific speed and head, concept of NPSH		
	Unit 4	**Reciprocating Pump**		
	A	Reciprocating pumps: classification, working principle		
	B	single stage and multi stage pumps, Air-vessel, Selection criterion		
	C	Comparision of reciprocating and Centrifugal pumps		
	Unit 5	**Miscellaneous Hydraulic Machines**		
	A	Jet pump, Air lift pump, Hydraulic Ram		
	B	Hydraulic press, Hydraulic Lift, Pressure Intensifier		
	C	Fluid Coupling & Torque Converter		
	Mode			
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Rajput R.K., Hydraulic Machines, 4th Edition, S. Chand, 2010.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch		**Mechanical Engineering**
1	Course Code	MEC334
2	Course Title	Introduction to Robotics Engineering
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	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	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: Modify 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: Choose 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
	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, gripping forces RCC and design features of grippers.		
	Unit 3	**Robotic vision systems**		
	A	Robot sensors, different types of contact and non-contact 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/unloading, inspection		
	C	Welding, spray painting and finish coating, and assembly, etc.		
	Unit 5	**Economy and safety related with robots**		
	A	Economic performance and evaluation strategies.		
	B	Robot installation and planning.		
	C	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 : 2021-2025**
Program: B. Tech		**Current Academic Year: 2021-2022**
Branch		**Mechanical Engineering**
1	Course Code	AUT301
2	Course Title	Automotive Safety Systems
3	Credits	2
4	Contact Hours (L-T-P)	2-0-0
	Course Status	Program Elective
5	Course Objective	1. To help the students to acquire in-depth knowledge of automotive safety systems. 2. To make students to understand the underlying concepts and methods of automotive safety. 3. To make students to differentiate the different active and passive safety systems. 4. To make the students to be familiar with latest safety systems. 5. To enable the students to apply the knowledge of safety systems to develop less accident-prone vehicles
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1: Comprehend the steps involved in the automotive body design to improve safety CO2: Differentiate the active and passive safety systems and their impact on passengers CO3: Explain the construction and working principle of various safety equipment employed in automobiles. CO4: Evaluate the behaviour of various safety systems on improving safety, comfort and convenience. CO5: Assess the performance of different testing procedures involved in passenger and occupant safety CO6: Evaluate the environmental impact, cost and economics of homologation and certification
7	Course Description	This course prepares students to install, remove, maintain and repair this system in an automobile. This course introduces students to vehicle safety and collision warning. It also discusses about ergonomics in vehicles.
8	Outline syllabus	
	Unit 1	**INTRODUCTION**
	A	Design of the body for safety, energy equation, engine location,
	B	Deceleration of vehicle inside passenger compartment, deceleration on impact with stationary and movable obstacle,
	C	Concept of crumble zone, safety sandwich construction.
	Unit 2	**ERGONOMICS and HUMAN RESPONSE to IMPACT**
	A	Importance of Ergonomics in Automotive safety, Locations of controls, Anthropometry, Human impact tolerance
	B	Determination of Injury thresholds, Severity Index, Study of comparative tolerance, Application of Trauma for analysis of crash injuries.
	C	Injury criteria's and relation with crash and modeling and simulation studies in dummy

	Unit 3	**ACTIVE and PASSIVE SAFETY**		
	A	Driving safety, conditional safety, perceptibility safety.		
	B	Operating safety, Exterior safety, Interior safety,		
	C	Deformation behaviour of vehicle body, speed and acceleration characteristics of passenger compartment on impact.		
	Unit 4	**SAFETY EQUIPMENTS, COLLISON WARNING and AVOIDANCE.**		
	A	Seat belt, regulations, automatic seat belt tightener system, collapsible steering column.		
	B	Tiltable steering wheel, air bags, Electronic system for activating air bags.		
	C	Steering wheel, air bags, electronic system for activating air bags and bumper design for safety.		
	Unit 5	**COMFORT and CONVENIENCE**		
	A	Steering and mirror adjustment, Central locking system ,		
	B	Garage door opening system, Tyre pressure control system.		
	C	Rain sensor system, Environment information system		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Raymond M. Brach and R. Matthew Brach, "Vehicle Accident Analysis and Reconstruction Methods", SAE International, 2011		
	Other References	1. Ulrich Seiffert and LotharWech, “Automotive Safety Handbook”, SAE International, 2007. 2. ISO Standards, ICS: 43.020, 43.040, 43.100 3. Automotive Industry Standards, AIS		

School: SET		**Batch : 2021-2025**
Program: B. Tech		**Current Academic Year: 2021-2022**
Branch:		**Mechanical Engineering**
1	Course Code	AUT302
2	Course Title	Auto Certification and Homologation
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To help students gain essential and basic knowledge on Auto Certification and Homologation for various types of vehicles, so as to equip them with knowledge required for getting certification and homologation for different classification of vehicles. 2. To train the students on vehicle classification with respect to certification and homologation. 3. To impart knowledge on vehicle testing procedures and norms for steering certification, engine certification, glasses and seat belts, brakes and wheels and lighting and signalling devices. 4. To teach students about the importance of advances and trends in certification and homologation.
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1: Describe the vehicle classification with respect to certification and homologation CO2: Identify the regulations governing for each vehicle type CO3: Apply proficiency in testing methodologies for vehicle level testing CO4: Perform and analyze system level testing for certification of the engine, braking, steering and lighting systems CO5: Obtain know-how in testing methodologies for certification of components testing CO6: Evaluate the environmental impact, cost and economics of homologation and certification
7	Course Description	This course prepares students to install, remove, maintain and repair this system in an automobile. This course introduces students to vehicle classification and engine and steering certification. It also discusses about ergonomics in vehicles.
8	Outline syllabus	
	Unit 1	**VEHICLE CLASSIFICATION**
	A	Specification & Classification of Vehicles (including M, N and O layout).

	B	Regulations overview (ECE, EEC, FMVSS, AIS, CMVR, ADR), Type approval and Conformity of Production		
	C	Engine and Vehicle specifications, Two Wheeler certification		
	Unit 2	**VEHICLE TESTING**		
	A	Vehicle Testing - Photographs, CMVR physical verification, Vehicle weightment, Coast down test, Brake test, ABS.		
	B	Turning circle diameter test, Steering effort test, Speedometer calibration, Pass by noise test,		
	C	External projection test, Gradability test, Acceleration control system		
	Unit 3	**ENGINE and STEERING CERTIFICATION**		
	A	Engine power test (petrol & diesel), Indian driving cycle and Vehicle mass emission.		
	B	Evaporative emission (petrol vehicles), Broad band / Narrow band EMI test. Steering Impact test (GVW<1500 kg), Body block test, Head form test,		
	C	Fixtures charges, Crash test with dummies, OBD I, Bumper testing, Documentation SHL, Certification charges		
	Unit 4	**GLASSES and SEAT BELTS**		
	A	Safety Glasses: Windscreen laminated safety glass, Side window / door glass.		
	B	Back light / Rear toughened glass, Wind screen wiping system, Wiper Blade		
	C	Safety belt assemblies, Safety belt anchorages, Seat anchorages & head restraints, door locks & door retention		
	Unit 5	**LIGHTING and SIGNALISNG DEVICES**		
	A	Performance requirement for lighting & signaling devices - Vertical orientation of dipped beam- head lamp, driver's field of vision, Head lamp assembly (glass lens & plastic lens).		
	B	Head lamp + Front position lamp / Front indicator lamp / front fog lamp, Rear combinational lamp (each additional function), Independent front position lamp / Front direction indicator lamp / Front fog lamp.		
	C	Rear combination lamp (single function), Warning triangles, Fuel tank: Metallic & Plastic (excluding fire resistance test).		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Raymond M. Brach and R. Matthew Brach, "Vehicle Accident Analysis and Reconstruction Methods", SAE International, 2011		
	Other References	1. Ulrich Seiffert and LotharWech, "Automotive Safety Handbook", SAE International, 2007. 2. ISO Standards, ICS: 43.020, 43.040, 43.100 3. Automotive Industry Standards, AIS		

School: SET		**Batch : 2021-2025**
Program: B. Tech		**Current Academic Year: 2021-2022**
Branch:		**ME with Automobile Engineering**
1	Course Code	AUT303
2	Course Title	Automotive Suspension and Steering Systems
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	To provide the students with sufficient background to understand the steering and suspension systems so as to enable them to design a steering and suspension system for better ride and comfort.
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1: Demonstrate the construction and mechanism of steering system components. CO2: Identify various suspension systems used in automotive vehicles. CO3: Summarize computer controlled suspension systems. CO4: Define the mechanisms involved in the stability of vehicle. CO5: Explain various steering and suspension system used in automotive vehicles. CO6: Explain the recent development in the area of suspension and steering systems.
7	Course Description	This course prepares students to install, remove, maintain and repair this system in an automobile. This course introduces students to steering system, and suspension system. It also discusses power assisted steering theory as well as the computer controlled suspension system of a latest vehicle.
8	Outline syllabus	
	Unit 1	**STEERING SYSTEM**
	A	Axle parts and materials, Loads and stresses, Front axle loads, Steering heads.
	B	Factors of wheel alignment, Wheel balancing, Centre point steering , Correct steering angle, Steering mechanisms
	C	Cornering force, Self-righting torque, Under steer and over steer, Lift off over steer, Torque steer
	Unit 2	**MECHANISM and LINKAGES**
	A	Condition for perfect rolling - Ackermann mechanism - Davis Mechanism.
	B	Steering linkage for rigid axle suspension, Steering linkage for independent suspension
	C	Steering gears, Special steering columns
	Unit 3	**POWER ASSISTED STEERING**
	A	Hydraulic power assisted steering, Integral piston linkage
	B	Rack and pinion, External cylinder power assisted
	C	Electric and electronic power assisted steering
	Unit 4	**INTRODUCTION to SUSPENSION SYSTEMS**
	A	Basic considerations - Types of suspension springs, Rubber springs and Plastic springs.
	B	Pneumatic suspension, Hydraulic suspension, Telescopic shock absorbers,

		Independent suspension		
	C	Front wheel independent suspension, Rear wheel independent suspension, Stabilizer Rod Types		
	Unit 5	**COMPUTER CONTROLLED SUSPENSION SYSTEMS and STABILITY CONTROL**		
	A	Introduction - Programmed ride control system, Electronic air suspension system, Air suspension system design variations.		
	B	Vehicle dynamic suspension system, Electronic suspension control (ESC) system, Integrated electronic systems and networks.		
	C	Vehicle stability control, Active roll control systems, Active cruise control, Lane departure warning systems, Collision mitigation systems, Telematics		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Automotive Engineering - Powertrain, Chassis System and Vehicle Body - David A. Crolla, Butterworth-Heinemann, First Edition, 2009		
	Other References	1. A Practical Approach to Motor Vehicle Engineering and Maintenance - Allan Bonnick. 2. Derek Newbold, Butterworth-Heinemann, Third Edition, 2011. 3. The Automotive Chassis: Engineering Principles - Prof. Dipl. Ing. Jörnsen Reimpell.		

School: SET		**Batch : 2021-2025**
Program: B. Tech		**Current Academic Year: 2021-2022**
Branch: ME with Automobile Engineering		**Semester:**
1	Course Code	AUT304
2	Course Name	Vehicle Inspection and Maintenance
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. To gain fundamental knowledge about various vehicle maintenances 2. To gain basics knowledge for preparing the inspection schedule 3. To acquire knowledge about the various engine faults and recovery methods 4. To impart the fundamental knowledge in fuel, cooling and lubrication systems. 5. To make the students to understand the common problem arises in transmission systems and rectification procedure. 6. To familiarize the students with the servicing procedures of braking, electrical and modern vehicle systems
6	Course Outcomes	On successful completion of the course, the student will be able to, CO1: Demonstrate the importance of vehicle inspection and maintenance. CO2: Diagnose the causes of Engine problem and provide the remedial action CO3: Implement the knowledge to rectify the fuel, cooling and lubrication systems defects. CO4: Identify the causes, servicing the clutch, gear box, universal joints, propeller shaft, and differential. CO5: Apply the basic knowledge and rectify the transmission systems problems CO6: Possess the knowledge about the inspection and maintenance of vehicle braking, electrical and modern vehicle systems.
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	**MAINTENANCE BASICS and INSPECTION SCHEDULES**
	A	Need for maintenance, types of maintenance: preventive and breakdown maintenance.
	B	Requirements of maintenance, preparation of check lists. Inspection schedule, maintenance of records
	C	Log sheets and other forms, safety precautions in maintenance: General safety, tool safety.

	Unit 2	**ENGINE SERVICE**		
	A	Tools used for engine disassembly, dismantling of engine components: cylinder head, valve train.		
	B	Dismantling of engine components: cylinder block, connecting rod, piston and crankshaft assembly		
	C	Cleaning and inspection of engine components, reconditioning of components		
	Unit 3	**FUEL and LUBRICATION SYSTEMS**		
	A	Servicing and maintenance of fuel system, Engine tune-up,		
	B	Cooling system: water pump, radiator, thermostat.		
	C	Lubrication system maintenance, Anticorrosion and anti-freeze additives.		
	Unit 4	**TRANSMISSION SYSTEMS and BRAKING SYSTEMS**		
	A	Servicing and maintenance of clutch, gear box, universal joints, propeller shaft, differential system.		
	B	Service and maintenance of brake – disc and drum brakes, steering wheel		
	C	Service and maintenance of suspension systems, wheel alignment and vehicle body maintenance.		
	Unit 5	**ELECTRICAL SYSTEMS**		
	A	Servicing and maintenance of battery, starter motor, alternator and generator.		
	B	Servicing and maintenance of ignition system, lighting system, electric horn		
	C	Servicing and maintenance of wiper motor, Modern vehicle systems.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Knott and Phil Knott, “An Introductory Guide to Motor Vehicle Maintenance: Light Vehicles”, EMS publishing, 2010.		
	Other References	1. William H. Crouse and Donald L. Anglin, “Automotive Mechanics”, 10th edition, 2007. 2. Tim Giles, “Automotive service: Inspection, maintenance and repair”, 3rd edition, 2007. 3. Jack Erjavec, “Automotive technology: A systems approach”, 5th edition, 2009.		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
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 : 2021-2025
Program: B. Tech.		Current Academic Year: 2021-22
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:		**School of Engineering and Technology**
Program: ME		**Current Academic Year: 2021-22**
Branch: EEE		**Semester: VIII**
1	Course Code	MIC008
2	Course Title	Virtual Instrumentation
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
5	Course Objective	1. Introduction to the various models of Virtual Instruments, their comparison with traditional instruments and major application areas of VI. 2. Introduction to basics of Labview 3. VI Programming techniques like loops, arrays, clusters, plotting and Strings and files. 4. Basics of signal conditioning techniques along with DAQ hardware and software and various signal processing techniques available in LABVIEW. 5. Advanced concepts in Lab view with main concepts of real time applications in Image acquisition and Motion control. 6. Building of Virtual Instruments with various types of controls and indicators.
6	Course Outcomes	CO1: Understand various models and areas of application of Virtual Instrumentation. CO2: Understand various components of Lab VIEW required for the development of VI. CO3: Understand and apply various programming functions of LabVIEW like loops, arrays, clusters and file I/Os for building of simple Virtual instruments. CO4: Understand the concepts of Data acquisition hardware and software and to apply basic signal processing techniques available in LabVIEW. CO5: Understand the real time applications of LabVIEW in motion control and Image acquisition. CO6: Able to build VI for simulated and real time applications.
7	Course Description	The course content of this subject includes an introduction to graphical system design. This course also focuses on introduction to LabVIEW which extensively elaborate the Graphical programming language .In Unit 3, building of VI by using loops, arrays, clusters etc. have been dealt with. Use of strings and I/O are also elaborated in this course. Data acquisition and various signal processing techniques are also covered in this course. Two real time applications motion control and Image acquisition by using LabVIEW have been elaborated in this course.

8	Outline syllabus			
	Unit 1	**Introduction**		
	A	Graphical system design model - design model, prototype model, deployment model		
	B	Building blocks of VI; Virtual instrument versus traditional instrument, Hardware and software in VI		
	C	Graphical system Design using LabVIEW; Graphical programming and Textual programming		
	Unit 2	**Graphical system Design using LabVIEW**		
	A	Advantages of LabVIEW; Components of VI Software - Front panel windows, Block diagram windows, Icon /connector pane		
	B	Creating and saving a VI; Toolbars, Palettes, Front panel controls and indicators, Block diagram – terminals, nodes, functions		
	C	Sub VIs, Express VIs and VIs, wires; Data types, Data flow program		
	Unit 3	**Programming Techniques**		
	A	Modular Programming in Lab View; Building VI front panel and block diagram		
	B	Loops – for and while loops, Local and Global variables in LabVIEW, Arrays in LabVIEW,		
	C	Clusters in LabVIEW; Conversion between arrays and clusters, Plotting data in LabVIEW, Strings and File I/O in LabVIEW		
	Unit 4	**Data Acquisition and Signal Processing in LabVIEW**		
	A	Transducers and Signal conditioning ,sampling and aliasing		
	B	Basics of DAQ hardware and software, DAQ modules and drivers for building virtual instruments		
	C	Fourier transforms; Power spectrum, Correlation methods; Windowing & filtering		
	Unit 5	**Advanced concepts in LabVIEW**		
	A	Data Socket, TCP/IP VI's synchronization		
	B	Serial interface buses - RS 232, RS485,USB		
	C	Concepts of real time systems; Image acquisition; Motion control		
	Mode of examination	Theory/Jury/Practical/Viva		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	1. Jovitha Jerome, "Virtual Instrumentation and LABVIEW", PHI Learning		
	Other References	1. C.L. Clark, "LabVIEW Digital Signal Processing", TMH Publishing Company. 2. Technical Manuals for DAQ Modules, Advantech and National Instruments 3. www.profhkverma.info: Chapter 2: Technologies/ Protocols for Wired Sensor Network 4. NI USER MANUAL http://www.ni.com/pdf/manuals/376445b.pdf www.ni.com		

School: SET		**Batch : 2021-2025**
Program: B. Tech.		**Current Academic Year: 2021-22**
Branch: Mechanical Engineering		**Semester: V**
1	Course Code	MEP 314
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 : 2021-25**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch:		**Mechanical Engineering**
1	Course Code	MCH001
2	Course Title	Mechanical Behaviour of Nanomaterials
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
5	Course Status	Honours
6	Course Outcomes	CO1: Explain the principle and influence of process variables of chemical and inert gas condensation route adopted for synthesis of nanostructured particles CO2: Compare and contrast different processing routes commonly adopted for fabrication of nanostructured components CO3: Analyse and suggest ways to alter the mechanical properties of a metal/alloy CO4: Select appropriate tools for nanomaterial characterization CO5: Distinguish between the mechanical behaviour of nanostructured components and conventional components possessing large grain size CO6: Develop nanostructured components as per the requirements
7	Course Description	The course along with mechanical behaviour of nanomaterials, also focuses extensively on synthesis and characterization of nanomaterials.
8	Outline syllabus	
	Unit 1	**Synthesis of Nanostructured Particles**
	A	Chemical Synthesis of Nanostructured Particles: Nucleation and Growth, Dispersion and Agglomeration, Metals, Ceramics and Cytotoxicity of Nanoparticles
	B	Synthesis of Nanostructured Materials by Inert-Gas Condensation (IGC) Methods: Introduction, Principle, Classification, Evaporation Techniques; and Classical Nucleation Theory
	C	Influence of IGC Process Variables on Particle Size, Advantages, Limitations and Recent Developments in IGC
	Unit 2	**Fabrication of Nanostructured Components**
	A	Phenomenology of Nanostructure Formation, High-Energy Ball Milling and Mechanical Attrition, Phase Stability at Elevated Temperatures and Severe Plastic Deformation (SPD)
	B	Thermodynamics, Mechanisms and Kinetics of Nanocrystalline Powder Densification: Thermodynamic and Kinetic Effects, Sintering Mechanisms, Role of Impurities, Green Density, Pore Size Effect on Densifications and Grain Growth
	C	Methods for Full Densification of Nanopowders: Characterization of Nanomaterials Densification, Density and Grain Size Measurements, Conventional and Non-Conventional Sintering methods
	Unit 3	**Strengthening in Polycrystalline Materials**
	A	Yield Strength of a Perfect Crystal, Dislocations: Types, Properties and Mechanisms of dislocation motion
	B	Initiation of plastic flow in single crystals, Stress-Strain behavior of single crystals, Plastic flow in poly-crystals and Geometrically Necessary Dislocations
	C	General Description of Strengthening, Work Hardening, Boundary Strengthening,

		Solid-Solution Strengthening and Particle Hardening		
	Unit 4	**Tools to Characterize Nanomaterials**		
	A	X-ray Diffraction (XRD), Small Angle X-ray Scattering (SAXS), Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM)		
	B	Atomic Force Microscopy (AFM) and Scanning Tunnelling Microscope (STM), Field Ion Microscope (FIM) and Three-dimensional Atom Probe (3DAP)		
	C	Nanoindentation: Principle, Working, Evaluation of Elastic modulus, Hardness, Wear properties etc.		
	Unit 5	**Mechanical Behaviour of Nanostructured Materials**		
	A	Models and Computer Simulations of Mechanical Behavior of Nanocrystalline Materials, Effect of Density, Pores and Microcracks		
	B	Elastic Properties, Strength, Hardness and Ductility of Nanocrystalline Metals		
	C	Mechanical Properties at Room and Elevated Temperatures: Al-Based Two-Phase Nanostructured Alloys, Mg-Based Amorphous and Nanostructured Alloys, Zr and Ti based Alloys and Mechanically Attrited Composites		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	**Nanostructured Materials: – Processing, properties and applications** by Karl C. Koch		
	Other References	**Textbook of Nanoscience and Nanotechnology by** B.S. Murthy, P. Shankar, Baldev Raj, B.B. Rath and James Murday		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021**
Branch:		**Mechanical Engineering**
1	Course Code	MCH002
2	Course Title	Material Behaviour and Failure Prediction
3	Credits	2
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Compulsory
5	Course Objective	1. To develop knowledge of crystals and their imperfections. 2. To understand different strengthening mechanisms of materials. 3. To understand behavior of materials under tension. 4. To understand mechanisms of brittle and ductile fracture. 5. To study the mechanisms of fatigue and creep.
6	Course Outcomes	On successful completion of this course the students will be able to CO1: Define different crystal systems and Bravais lattice along with defects in crystals. CO2: Classify different strengthening mechanisms. CO3: Develop the knowledge of tensile test. CO4: Analyse mechanisms of brittle and ductile fracture. CO5: Explain the mechanisms of fatigue and creep in materials. CO6: Build the knowledge of deformation of materials under tension, fatigue and creep.
7	Course Description	This course focuses on the deformation behavior of materials under tension, fatigue, creep and fracture behavior of brittle and ductile materials.
8	Outline syllabus	
	Unit 1	**Crystal Systems and Imperfections**
	A	Basic knowledge about various crystal systems, Bravais lattice
	B	Crystal Imperfections such as point defects, line defects, surface and interfacial defects
	C	Types of dislocations, Bergers vector, dislocation loop, dislocations in FCC, BCC and HCP lattice
	Unit 2	**Strengthening mechanism of crystalline materials**
	A	Grain boundary strengthening
	B	Solid solution strengthening, Strengthening due to second phase particles
	C	Strain hardening, Bauschinger effect
	Unit 3	**Tensile test**
	A	Engineering stress-strain curve, true stress-strain curve

	B	Instability in tension, effects of strain rate and temperature on tensile properties		
	C	Notch tensile test		
	Unit 4	**Fracture**		
	A	Types of fracture in metals, theoretical cohesive strength		
	B	Griffith theory of brittle fracture, modifications of the Griffith theory		
	C	Fracture of single crystals, ductile fracture, notch effect in fracture		
	Unit 5	**Fatigue and Creep in materials**		
	A	Fatigue, crack initiation and propagation, S-N Curve		
	B	Surface effects and fatigue, corrosion Fatigue		
	C	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. G. E. Dieter, Mechanical metallurgy, McGRAW-HILL BOOK COMPANY..		
	Other References			

School: SET		**Batch : 2021-25**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch:		**Mechanical Engineering**
1	Course Code	MCH003
2	Course Title	Intermediate Fluid Mechanics
3	Credits	4
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Elective
5	Course Objective	To use mathematics to make models of fluid flow and solve them for some simple engineering applications
6	Course Outcomes	After completion of this course, students will be able to: CO1. Understand the concept of fields and local rates of change CO2. Solve simple problems as analytical solutions of NS equation CO3. Make approximations in fluid mechanics. CO4. Use simple concepts of boundary layers CO5. Understand simple models of turbulent flows CO6. Make simple applications of unsteady flows
7	Course Description	The course teaches fluid mechanics and its application with mo9re mathematics
8	Outline syllabus	
	Unit 1	**Fluid Flow fields and rates of change with time**
	A	Introduction to Eulerian descriptions and time rates of change
	B	Control volume analysis and Reynolds transport theorem
	C	Applications to mass. Momentum and energy balance for CVs
	Unit 2	**Navier-Stokes equation**
	A	Derivation of NS equation
	B	Applications to some fully-developed flows
	C	Applications to Raleigh problems
	Unit 3	**Similitude and Approximations**
	A	Normalization of equations and Pi numbers
	B	Approximations.
	C	Low Re flows
	Unit 4	**Boundary layer flows**
	A	Introduction to boundary layers
	B	Blassius solutions and Falkner Skan solutions
	C	Boundary layue separation
	Unit 5	**Turbulence and Unsteady flows**
	A	Basic concepts of turbulence
	B	Simple models of turbulence
	C	Unsteady flows
	Mode of	Theory

	examination			
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Som and Biswas: Introduction to Fluid Mechanics and Fluid Machines, Gupta and Gupta: Fluid Mechanics and Its applicastions		
	Other References			

School: SET		**Batch : 2021-25**
Program: B.Tech		**Current Academic Year: 2021-22**
Branch		**Mechanical Engineering**
1	Course Code	MCH004
2	Course Title	Design for 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, Pre and post processing of additive manufacturing and mathematical modeling for additive manufacturing
6	Course Outcomes	On completion of this course students will be able to: 1. Explain the working principle and its application. 2. Select the suitable material for fabricating a given product 3. Identify pre and post processing of additive manufacturing 4. Select an Additive manufacturing technology for a given component 5. Design and develop mathematical model for additive manufacturing 6. Explore the applications and limitations of AM processes in various fields
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	Introduction to Additive Manufacturing and classification. of Additive Manufacturing Processes: Additive, Subtractive, Formative, Generic AM process
	B	Applications of additive manufacturing in rapid prototyping, rapid manufacturing, rapidtooling, repairing and coating
	C	Indirect Processes - Indirect Prototyping. Indirect Tooling, Indirect Manufacturing
	Unit 2	**Materials science for Additive Manufacturing**
	A	Use of material for additive manufacturing. Liquid Based Materials : Photopolymers development , Photopolymer Chemistry
	B	Solid Based Materials : Polymers, Metals, Composites, Ceramics
	C	Use of multiple materials, multifunctional and graded materials in AM Role of solidification rate ,Evolution of non-equilibriumstructure property relationship, Grain

		structure and microstructure.		
	Unit 3	**Pre and Post Processing of Additive Manufacturing Processes**		
	A	Pre-Processing in Additive Manufacturing :Preparation of 3D-CAD model, Reverse engineering and Reconstruction of 3D-CAD model, Part orientation and support generation,		
	B	STL Conversion, STL error diagnostics, Slicing and Generation of codes for tool path, Surface preparation of materials		
	C	Post-Processing in Additive Manufacturing: Support material removal, improvement of surface texture, accuracy and aesthetic; property enhancements.		
	Unit 4	**Additive Manufacturing Technology**		
	A	3D-printing, Stereo lithography apparatus (SLA), Fused deposition modelling (FDM), Laminated Object Manufacturing (LOM)).		
	B	Selective deposition lamination (SDL), Ultrasonic consolidation, Selective laser sintering (SLS), Laser engineered net shaping (LENS), Electron beam free form fabrication (EBFFF),		
	C	Electron beam melting (EBM), Plasma transferred arc additive manufacturing (PTAAM), Tungsten inert gas additive manufacturing (TIGAM), Metal inert gas additive manufacturing (MIGAM).		
	Unit 5	**Mathematical Models for Additive manufacturing**		
	A	Transport phenomena models: temperature, fluid flow and composition, buoyancy driven tension driven free surface flow pool		
	B	Case studies: Numerical Modeling of additive manufacturing process, Powder bed melting based process, droplet based printing process,		
	C	Residual stress, part fabrication time, cost, optimal orientation, defects in additive manufacturing and role of transport simulations(choice of parameter, model validation)		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Gibson D W Rosen, Brent Stucker., Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing, Springer,2010		
	Other References	1. Chua C K, Leong K F, Chu S L, Rapid Prototyping: Principles and Applications in Manufacturing, World Scientific. 2. 3. Liou W L, Liou F W, Rapid Prototyping and Engineering applications: A tool box for prototype development, CRC Press. 3. Kamrani A K, Nasr E A, Rapid Prototyping: Theory and practice, Springer, 4. Noorani R, Rapid Prototyping: Principles and Applications in Manufacturing, John Wiley & Sons		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch		**Mechanical Engineering**
1	Course Code	MCH005
2	Course Title	Finite Element Methods in Solid Mechanics
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Honours Elective
5	Course Objective	• To enable the students understand the mathematical and physical principles underlying the Finite Element Method (FEM) as applied to solid mechanics problems • To teach the students the characteristics of various elements and selection of suitable elements for the problems being solved • To make the students derive finite element equations for simple and complex elements
6	Course Outcomes	On successful completion of this course, students will be able to CO1. Distinguish different numerical methods involved in Finite Element Analysis CO2. Apply equations in finite element methods for 1D, 2D and 3D problems. CO3. Apply shape functions in finite element formulations and use linear, quadratic, and cubic shape functions for interpolation CO4. Analyse beams and shafts using finite element analysis CO5. Formulate and solve basic problems in solid mechanics CO6. Apply commercial FEA packages like ANSYS and modern CAD/CAE tools for solving real life problems.
7	Course Description	This course introduces finite element methods for the analysis of solid mechanics problems. Applications of finite element methods, modelling and analysis of problems, and interpretation of numerical results.
8	Outline syllabus	
	Unit 1	**Introduction to Finite Element Method**
	A	General description of Finite Element Method – Historical development
	B	Comparison with classical methods – Other numerical methods such as FDM, BEM, etc.
	C	General procedure of FEM– Application software's in FEM.
	Unit 2	**Approximate Solutions to Engineering Problems**
	A	General field problems – formulation of Governing Differential Equations.
	B	Approximate solution as a polynomial, minimization of residue
	C	Method of least squares and Galerkin method, Variational formulation Ritz method
	Unit 3	**Shape functions in Finite Element Formulations**
	A	Formulation for the subdomain using interpolation polynomial - Nodal

		approximation using shape function		
	B	Selection of interpolation polynomials (shape functions) for 1 D and 2 D elements		
	C	Derivation of shape functions for various elements – Isoparametric elements. Numerical Integration and its advantages.		
	Unit 4	**Bar Problems**		
	A	II order problems - Bar Problem – Formulation for the whole domain – Formulation for the subdomain (finite element) using interpolation polynomial		
	B	Nodal approximation using shape functions of Bar elements. Computing stiffness, mass and force element matrices		
	C	Assembly of bar element matrices – Application of B.Cs – solution		
	Unit 5	**Beam Problems**		
	A	IV order problems - Beam Problem – Formulation for the whole domain – Formulation for the subdomain (finite element) using interpolation polynomial		
	B	Nodal approximation using shape functions of Beam elements. Computing stiffness, mass and force element matrices		
	C	Assembly of beam element matrices – Application of B.Cs – solution		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%
	Text book/s*	Tirupathi R. Chandrupatla and Ashok D. Belugundu, Introduction to Finite Elements in Engineering, 4th Edition, Prentice Hall, 2011		
	Other References	1 Reddy, J.N., Finite Element Method in Engineering, Tata McGraw Hill, 2007. 2. Young W Kwon and Hyochoong Bang, The finite element method using MATLAB, 2ed, CRC Press, London. 2000. 3. Seshu P, Textbook of Finite Element Analysis, PHI. 2004		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch:		**Mechanical Engineering**
1	Course Code	MCP005
2	Course Title	Finite Element Methods in Solid Mechanics Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Honours Elective
5	Course Objective	• To enable the students understand the mathematical and physical principles underlying the Finite Element Method (FEM) as applied to solid mechanics problems • To teach the students the characteristics of various elements and selection of suitable elements for the problems being solved To make the students derive finite element equations for simple and complex elements
6	Course Outcomes	On successful completion of this course, students will be able to CO1. Analyse the stress and dynamic behaviour in a bar due to point load and uniformly distributed load CO2. Interpret the behaviour of stress resistance in a bar with uniform and non-uniform cross section. CO3. Analyse the stress behaviour of beam with uniform and varying cross section and varying BCs CO4. Apply FEM for analysing the dynamic behaviour beams CO5. Interpret the use of numerical integration in FEM for faster computations CO6. Apply commercial FEA packages like ANSYS and modern CAD/CAE tools for solving real life problems.
7	Course Description	This course introduces finite element methods for the analysis of solid mechanics problems. Applications of finite element methods, modelling and analysis of problems, and interpretation of numerical results.
8	Outline syllabus	
	Experiment 1	Problems in stress analysis in a bar due to point load and uniformly distributed load
	Experiment 2	Problems in stress analysis in a bar with uniform and non-uniform cross section.
	Experiment 3	Problems in 1 D bar element - Vibration Problem.
	Experiment 4	Problems in 1 D beam element- Stress analysis of beam with uniform and varying cross section
	Experiment 5	Problems in 1 D beam element- Stress analysis of beam with varying BCs.

	Experiment 6	Problems in Beam element- With mass and springs attached to ends.		
	Experiment 7	Problems in shafts- Whirling behaviours of shaft		
	Experiment 8	Problems on Numerical integration and Gauss Quadrature.		
	Mode of examination	Practical		
	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. 2. A		
	Software	MATLAB, ANSYS		

School: SET		**Batch : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch:		**Mechanical Engineering**
1	Course Code	MCH006
2	Course Title	Design with Composite Materials
3	Credits	3
4	Contact Hours (L-T-P)	3-0-0
	Course Status	Honours Elective
5	Course Objective	• Provide students with a basic understanding of the composition and uses of composite materials, their structural and mechanical properties. • Develop the student's skills in understanding the different manufacturing methods available for composite material • Illuminate the knowledge and analysis skills in applying mechanics to the composite materials.
6	Course Outcomes	On successful completion of this course, students will be able to CO1. Classify composite materials and their applications CO2. Apply the principles of micro and macro mechanics in composite materials CO3. Analyze composite laminates using the fundamentals of Classical Lamination Theory CO4. Apply failure criteria on composite structures subjected to various types of loading CO5. Design a composite structure for the specific mechanical applications. CO6. Demonstrate the design of composite laminates subjected to mechanical, thermal stresses for different environmental conditions.
7	Course Description	This course provides students a background in modern lightweight composite materials which are being used in an ever-increasing range of applications and industries. Topics covered include: current and potential applications of composite materials, fibers, matrices, manufacturing methods for composites, review of elasticity of anisotropic solids, micromechanics of continuous and discontinuous fiber systems, laminated plate analysis, static analyses of laminated composites, edge effects in laminates and both macroscopic and microscopic failure analysis of composite materials and design of laminates.
8	Outline syllabus	
	Unit 1	**Introduction & Applications**

	A	Composites, Multiscale Composites and Nanocomposites, Reinforcements and Matrices,		
	B	Properties of the composites in comparison with standard materials		
	C	Applications: Applications of metal, ceramic and polymer matrix composites, Multiscale and nano composites, Hybrid composite sand Sandwich composites, self-reinforced composites and carbon/carbon composites		
	Unit 2	**Micro and Macro mechanical analysis of composite materials**		
	A	Micromechanical Analysis of a Lamina. Volume and Mass Fractions, Density, and Void Content-		
	B	Prediction of engineering properties using micromechanics-Material properties of the fiber and matrix		
	C	Macro mechanical analysis of a lamina -linear elastic stress-strain characteristics of FiberReinforced material		
	Unit 3	**Classical Lamination Theory**		
	A	Kirchhoff Hypothesis- Laminate Nomenclature and Classification. Laminate strains and displacements - Laminate stresses & strains		
	B	Stress distributions through the thickness- Force and moment resultants		
	C	Laminate stiffness matrix: ABD Matrix-Classification of laminates and their effect on the ABD Matrix-Elastic couplings		
	Unit 4	**Theories of Failures of Laminates**		
	A	Maximum stress and strain criterion		
	B	Tsai-Hill, Tsai-Wu criterion		
	C	Inter-laminar stresses- Impact resistance		
	Unit 5	**Design of Composite Products**		
	A	Smart composites, Joints and assembly of composites, Design for assembly and environment		
	B	Materials selection- design principles in composites for various load carrying applications		
	C	Case studies in design and development of composite parts, boats, pressure vessels, automotive parts, aerospace parts, electronics parts and composites for space vehicles.		
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		30%	20%	50%

		1. Autar, K. Kaw, Mechanics of Composite Materials, Taylor & Francis, 2006
	Other References	1. Robert Millard Jones, Mechanics of composite materials, Taylor & Francis, 1999 2. Laszlo, P. Kollar, George, S. Springer, Mechanics of composite structures, Cambridge University Press, 2003.

School: SET		Batch : 2021-2025
Program: B.Tech		Current Academic Year: 2021-2022
Branch		Mechanical Engineering
1	Course Code	MCP006
2	Course Title	Design with Composite Materials Lab
3	Credits	1
4	Contact Hours (L-T-P)	0-0-2
	Course Status	Honours Elective
5	Course Objective	• Provide students with a basic understanding of the composition and uses of composite materials, their structural and mechanical properties. • Develop the student's skills in understanding the different manufacturing methods available for composite material • Illuminate the knowledge and analysis skills in applying mechanics to the composite materials.
6	Course Outcomes	On successful completion of this course, students will be able to CO1. Evaluate the fundamental elastics properties of UD glass/epoxy composite materials CO2. Test and Interpret static bending behaviour of glass/epoxy composite beams CO3. Analyse buckling behaviour of glass/epoxy composite beams CO4. Test and Interpret dynamic bending behaviour of UD glass/epoxy composite beams CO5. Design a glass/epoxy laminate with high stiffness through optimizing the volume fraction and ply orientations CO6. Formulate an optimization problems for designing a laminate and validate with experimentation
7	Course Description	This course provides students a background in modern lightweight composite materials which are being used in an ever-increasing range of applications and industries. Topics covered include: current and potential applications of composite materials, fibers, matrices, manufacturing methods for composites, review of elasticity of anisotropic solids, micromechanics of continuous and discontinuous fiber systems, laminated plate analysis, static analyses of laminated composites, edge effects in laminates and both macroscopic and microscopic failure analysis of composite materials and design of laminates.
8	Outline syllabus	
	List of Experiments	
	Experiment 1	Evaluate the Elastic moduli in longitudinal and transverse direction of UD glass/epoxy composite materials and verify with micromechanics
	Experiment 2	Evaluate the Shear moduli in in-plane direction of UD glass/epoxy composite materials

		and verify with micromechanics		
	Experiment 3	Test and Interpret central deflection of UD glass/epoxy composite beams with uniform cross section and verify with numerical simulation		
	Experiment 4	Test and Interpret central deflection of UD glass/epoxy composite beams with tapered cross section and verify with numerical simulation		
	Experiment 5	Evaluate the critical buckling load of UD glass/epoxy composite beams and verify with numerical simulation		
	Experiment 6	Test and Interpret dynamic response of UD glass/epoxy composite beams and verify with numerical simulation		
	Experiment 7	Design a glass/epoxy laminate with high stiffness through optimizing the volume fraction and ply orientations		
	Experiment 8	Formulate an optimization problem for designing a laminate and validate with experimentation		
	Mode of examination	Practical		
	Weightage Distribution	CA	MTE	ETE
		60%	0%	40%
	Text book/s*	3. Young W Kwon and Hyochoong Bang, The finite element method using MATLAB, 2ed, CRC Press, London. 2000. 4. A		

School: SET		**Batch : 2020-2024**
Program: B.Tech		**Current Academic Year: 2020-21**
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	After successful completion of this course students should be able: CO1. Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics. CO2. Solve the problem of transporting and assignment moving/assigning the products from origins to destinations which leads to optimization of resources. CO3. Understand and solve problems of queuing theory and inventory management. CO4. Propose the best strategy using decision making methods under uncertainty and game theory. CO5. Prepare cost effective solutions for network problems using PER/CPM 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 : 2021-2025**
Program: B.Tech		**Current Academic Year: 2021-2022**
Branch: ME		**Semester: III**
1	Course Code	MEP226
2	Course Title	Numerical Analysis with MATLAB
3	Credits	3
4	Contact Hours (L-T-P)	2-0-2
	Course Status	Regular
5	Course Objective	To develop skill of using MATLAB to find numerical solutions to simple problems
6	Course Outcomes	On successful completion of this course, students will be able to: CO1:Apply MATLAB for simple arithmetic operations CO2:Evaluate numerically the roots of complex functions CO3: Estimate solution to system of algebraic equations CO4: Solve numerically the interpolated values from a tabular data and to do table look-ups. CO5: Evaluate numerically the derivatives of functions and tabulated data to simple ode's CO6: Develop optimal solution for numerical by iteration
7	Course Description	The course introduces numerical analysis methodology and techniques. It is a practical course in which the emphasis is less on writing functions and more on using functions.
8	Outline syllabus	
	Unit 1	**Introductory concepts**
	A	Arithmetic operations and matrix operations on MATLAB
	B	Writing to files and plotting using MATLAB
	C	Basic concepts of programming revised.
	Unit 2	**Finding roots and optimization**
	A	Bisection, Secant, Regula-falsi and Newton-Raphson Methods,
	B	Fixed-point methods
	C	Optimization: bracket methods, Goldmin and Goldmax, parabolic interpolation
	Unit 3	**Solution of linear algebraic equations**
	A	Cramer rule, Gauss-elimination, tri-diagonal matrices, LU factorization
	B	Iterative methods: Gauss-Sidel Method, for linear and non-linear equations
	C	Newton-Rhapson
	Unit 4	**Interpolation**
	A	Newton polynomial method, Lagrange polynomial interpolation, Suppressing oscillations
	B	Splines
	C	Table look-up, binary table look-up
	Unit 5	**Integration, differentiation and ODE's**
	A	Trapezoidal rule, Simpson rules, Richardson extrapolation (Romberg method); Gauss quadrature
	B	Forward, central and backward differences, Richardson extrapolation,

		LaGrange deriatives		
	C	Solving ODEs, Euler methods, predictor-corrector methods, Runge-Kutta 4th order method, solution of Blassius equation.		
	Mode of examination	Lab Examination		
	Weightage Distribution	CA	MTE	ETE
		60%		40%
	Text book/s*	1. Numerical methods for engineers with Matlab by S. Chapra and Canale		
	Other References	2. Getting Started with MATLAB by RudraPratap		