Programme Structure

Master of Technology

in

Mechanical Engineering

Programme code: SET0616

(Batch: 2024-2026)

Department of Mechanical Engineering

Sharda School of Engineering and Technology

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

M1. Transformative educational experience
M2. Enrichment by educational initiatives that encourage global outlook
M3. Develop research, support disruptive innovations and accelerate entrepreneurship
M4. Seeking beyond boundaries

Core Values

- Integrity
- Leadership
- Diversity
- Community

1.2.1 Vision and Mission of the Department of Mechanical Engineering

Vision of the Department of Mechanical Engineering

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

Mission of the Department of Mechanical Engineering

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

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

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

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

1.3 Programme Educational Objectives (PEO)

1.3.1 Programme Educational Objectives (PEO) M.Tech Mechanical Engineering

The Educational Objectives of M.Tech Mechanical Engineering are:

PEO1: Graduates will be excel in applying knowledge of production engineering to create novel

PEO2: Graduates will be able to understand and explore the behaviour of existing and new materials suitable for the design and development of products.

PEO3: Graduates will be able to apply the knowledge of industrial engineering to recognize, comprehend, analyze and to solve complex real life problems.

PEO4: Graduates will be able to build up the adequate communication skills, proficient personality and moral esteems to be a good human beings, responsible citizens and capable experts.

PEO5: Graduates will be capable of applying relevant skills of research and development and other creative/ innovative efforts in their professional career.

1.3.2 Mapping of PEOs with School Mission Statements:

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

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

1.3.2.1 Map PEOs with Department Mission Statements:

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

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

1.3.3 Programme Outcomes (PO's)

- PO1: Apply the engineering knowledge of mechanical engineering practices such as design, manufacturing, thermal sciences, automation and industrial engineering to the solution of complex mechanical systems.
- PO2: Identify, formulate, solve and analyse the mechanical system such as machine tools, press tools and thermal systems such as IC engines, refrigeration, air-conditioning and power generating systems.
- PO3: Conceptualize and evaluate the mechanical engineering aspects and select feasible solution using modern industrial management techniques and quality assurance systems considering safety, environment, and other realistic constraints.
- PO4: Develop the skills of good researchers to work on a problem, starting from the scratch, to research in to literatures, methodologies, techniques, tools and conduct experiments and interpret data.
- PO5: Make use of modern engineering tools, software and equipment to analyse and complex mechanical engineering problems.
- PO6: Demonstrate the traits of manager in handling engineering projects, related finance and coordinate work force towards achieving desired goals.
- PO7: Perceive the traits of professional integrity and ethics, and demonstrate the responsibility to implement the research outcome for sustainable development of the society.
- PO8: Communicate effectively to comprehend and write effective reports following engineering standards.
- PO9: Demonstrate the skills of presenting the work unequivocally before scientific community and exchange the scientific thoughts.
- PO10: Recognize the need for and ability to engage in life-long learning in the broadest context to work in research laboratories and multidisciplinary environments.

1.3.4 Mapping of Programme Outcome Vs Programme Educational Objectives

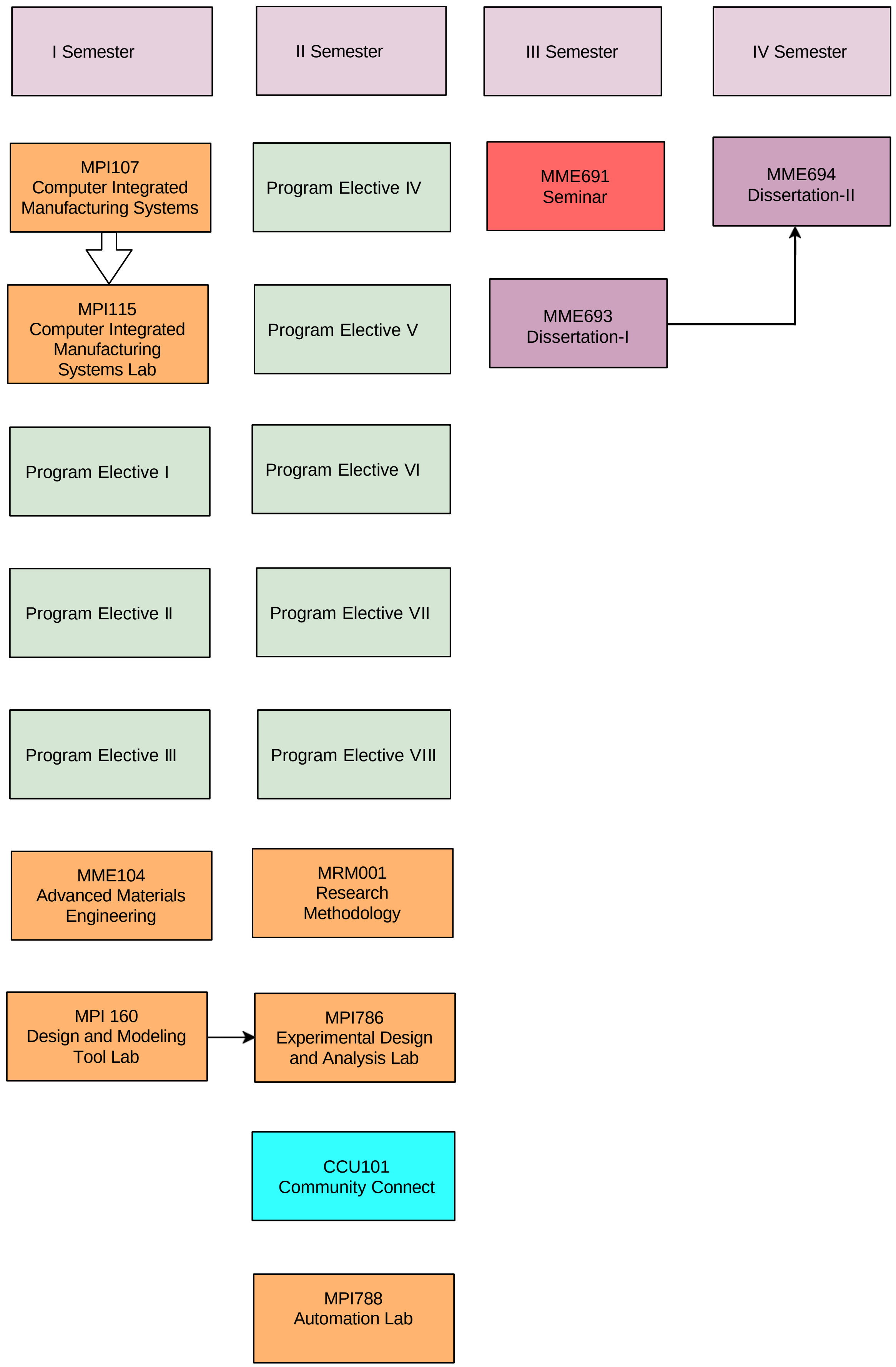
Mapping	PEO1	PEO2	PEO3	PEO4	PEO5
PO1	3	2	2	-	2
PO2	3	2	3	-	2
PO3	3	2	3	-	3
PO4	3	2	3	-	2
PO5	2	2	1	1	2
PO6	2	2	1	3	2
PO7	2	2	1	3	2
PO8	2	2	1	3	2
PO9	3	2	2	1	3
PO10	3	2	3	2	3

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

1.3.5 Programme Articulation Matrix

Courses	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MPI107	2	1	1	-	2	-	-	2	-	-
MME104	2	2	2	3	2	-	-	2	-	-
MPI160	2	2	2	2	2	-	-	3	2	2
MPI115	2	2	3	2	-	2	1	2	1	2
MRM001	-	1	1	1	1	-	-	2	1	2
MPI786	2	1	2	2	2	-	-	2	-	-
CCU101	2	1	1	1	-	1	2	-	-	-
MPI788	3	-	-	3	2	-	-	-	3	-
MME693	3	3	2	-	2	-	2	1	1	2
MME694	3	3	2	-	2	-	2	1	1	2
MME122	3	3	3	-	-	-	-	1	2	3
MMP 122	3	3	3	-	-	-	-	1	2	3
MME112	3	2	2	3	2	-	-	2	-	2
MME114	2	2	2	2	2	-	-	2	-	-
MPI 101	2	2	2	2	2	-	1	2	1	2
MME118	2	2	1	1	2	-	-	2	-	2
MME015	2	2	3	2	3	1	2	1	3	2
OEM 015	3	2	2	-	-	2	-	-	-	2
MME127	2	2	3	-	3	-	-	-	-	1
MME121	2	2	1	-	-	-	-	-	1	1
MME119	2	2	1	2	2	1	-	-	1	1
MME123	2	2	1	2	2	1	2	3	3	1
MME120	3	3	-	1	-	-	-	-	-	1
MME124	3	2	2	2	-	-	-	1	1	1
MME010	2	2	2	-	-	2	2	2	2	2
MME102	2	2	1	1	-	-	-	2	2	2
MME 108	3	3	1	-	-	-	-	-	-	2
MME125	2	2	2	-	-	-	1	1	1	1
MME126	2	2	1	-	-	2	3	1	2	1
MME115	3	3	1	-	-	-	-	-	-	2
MME128	2	2	2	-	-	-	-	-	-	2

Curriculum Flow Chart: M.Tech Mechanical Engineering



Components	Credits
Science	NA
Humanities & Management	NA
Programme Core	14
Programme Elective	29
Open Elective	NA
Soft Skills	2
Programming and Coding Courses	NA
Internship /CC/PBL/RBL	2
Capstone	26
Prerequisite	
Co-Requisite	

Sharda School of Engineering and Technology
M.Tech-Mechanical Engineering
Batch: 2024-2026
TERM: I

S. No.	Subject Code	Subjects	Teaching Load			Credits	Pre-Requisite/Co Requisite	CC/DSE/ Practical
			L	T	P			
THEORY SUBJECTS								
1.	MPI107	Computer Integrated Manufacturing Systems	3	0	0	3		CC
2.	PE I	Programme Elective I	3	1	0	4	-	DSE
3.	PE II	Programme Elective II	3	0	0	3	-	DSE
4.	PE III	Programme Elective III	3	0	0	3	-	DSE
5.	MME104	Advanced Materials Engineering	3	0	0	3	-	CC
Practical/Viva-Voce/Jury								
6.	MPI 160	Design and Modeling Tool Lab	0	0	4	2	-	Practical
7.	MPI115	Computer Integrated Manufacturing Systems Lab	0	0	2	1		Practical
Total credits						**19**		

Sharda School of Engineering and Technology
M.Tech-Mechanical Engineering
Batch: 2024-2026
TERM: II

S. No.	Course Code	Course	Teaching Load			Credits	Pre-Requisite/Co Requisite	DSE/CC/Practical/ Community Connect
			L	T	P			
THEORY SUBJECTS								
1.	PE IV	Programme Elective IV	3	1	0	4	-	DSE
2.	PE V	Programme Elective V	3	1	0	4	-	DSE
3.	PE VI	Programme Elective VI	3	1	0	4	-	DSE
4.	PE VII	Programme Elective VII	3	0	0	3	-	DSE
5.	PE VIII	Programme Elective VIII	4	0	0	4	-	DSE
6.	MRM001	Research Methodology	2	0	0	2	-	CC
Practical/Viva-Voce/Jury								
7.	MPI786	Experimental Design and Analysis Lab	0	0	4	2	-	Practical
8.	CCU101	Community Connect	0	0	4	2	-	Community Connect
9.	MPI788	Automation Lab	0	0	2	1	-	Practical
Total credits						**26**		

Sharda School of Engineering and Technology
M.Tech-Mechanical Engineering
Batch: 2024-2026
TERM: III

S. No.	Course Code	Course	Teaching Load			Credits	SEC/Practical/Dissertation
			L	T	P		
Practical/Viva-Voce/Jury							
1.	MME691	Seminar	-	-	-	2	SEC
2.	MME693	Dissertation-I	-	-	-	10	Dissertation
Total credits						**12**	

Sharda School of Engineering and Technology
M.Tech-Mechanical Engineering
Batch: 2024-2026
TERM: IV

S. No.	Course Code	Course	Teaching Load			Credits	SEC/Practical/Dissertation
			L	T	P		
Practical/Viva-Voce/Jury							
1.	MME694	Dissertation-II	-	-	-	16	Dissertation
Total credits						**16**	

List of Programme Electives: M.Tech- Mechanical Engineering

Elective 1: MPI112- Advanced Manufacturing Techniques (3-0-0) 3
Elective 2: MME114- Industrial Robotics (3-1-0) 4
Elective 3: MPI101- Production and Inventory Decisions (3-0-0) 3
Elective 4: MPI107- Computer Integrated Manufacturing Systems (3-0-1) 4 (Lab)
Elective 5: MME118- Smart Manufacturing (4-0-0) 4
Elective 6: MME015- Supply Chain Management (4-0-0) 4
Elective 7: OEM015- Renewable Energy & Energy Management (3-0-0) 3
Elective 8: MME 127- Advance Operations Research (4-0-0) 4
Elective 9: MME121- Mechanics of Composite Materials (3-0-0) 3
Elective 10: MME123- Advanced Machine Design (3-0-0)3
Elective 11: MME119- Machine Tool Design (3-1-0) 4
Elective 12: MME120- Fracture Mechanics (4-0-0) 4
Elective 13: MME124- Design For Manufacture And Assembly (4-0-0) 4
Elective 14: MME010- Advanced Power Plant Engineering (3-0-0) 3
Elective 15: MME102- Heat and Mass Transfer (3-1-0) 4
Elective 16: MME108- Advance Mechanics of Fluids (3-0-0) 3
Elective 17: MME125- Gas Turbine and Compressors (4-0-0) 4
Elective 18: MME126- Advanced Thermodynamics (3-0-1) 4 (Lab)
Elective 19: MME115- Refrigeration &Air-Co-conditioning and Cryogenics Engineering (4-0-0) 4
Elective 20: MME128- Solar Energy Technology (4-0-0) 4

School: SSET		**Batch: 2024-2026**		
Programme: M.Tech Branch: ME		**Current Academic Year: 2024-2025**		
1	**Course No.**	MPI107		
2	**Course Title**	**Computer Integrated Manufacturing Systems**		
3	**Credits**	3		
4	**Contact Hours (L-T-P)**	3-0-0		
5	**Course Objective**	This course will provide in-depth coverage of Computer Integrated Manufacturing. It contains a high proportion of hands-on study, particularly in the areas of Computer Aided Design/Computer Aided Manufacturing (CAD/CAM), and Computer Numerical Control (CNC).		
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO 1- Identify the types of production and various costs involved in manufacturing with its analysis. CO 2 – Analyse and solve the design problems of different type of transfer mechanism. CO 3 – Demonstrate the CNC turning & milling Programme and get knowledge about industrial robot. CO 4 – Design and analysis of automatic storage and retrieval system CO 5 – Explain various automated Inspection methods. CO 6 - Apply the system modelling tools in CIM and the fundamental concepts of data communications for computer integrated manufacturing.		
7	**Outline syllabus:**			**CO**
7.01	MPI107.A	**Unit A**	**Introduction and Automated Flow Lines**	
7.02	MPI107.A1	Unit A Topic 1	Types of production - Functions - Automation strategies.	CO 1
7.03	MPI107.A2	Unit A Topic 2	Production economics - Costs in manufacturing	CO 1
7.04	MPI107.A3	Unit A Topic 3	Break-even-analysis.	CO 1
7.05	MPI107.B	**Unit B**	**Automated flow lines**	
7.06	MPI107.B1	Unit B Topic 1	Transfer mechanism - Buffer storage	CO 2
7.07	MPI107.B2	Unit B Topic 2	Analysis of transfer lines - Line unbalancing concept	CO 2
7.08	MPI107.B3	Unit B Topic 3	Automated assembly systems.	CO 2
7.09	MPI107.C	**Unit C**	**Numerical Control**	
7.10	MPI107.C1	Unit C Topic 1	NC-CNC Programming	CO 3
7.11	MPI107.C2	Unit C Topic 2	Part programming , DNC - Adaptive control	CO 3
7.12	MPI107.C3	Unit C Topic 3	Robot anatomy - Specifications - End	CO 3

			effectors – Sensors, Robot cell design.	
7.13	MPI107.D	**Unit D**	**AUTOMATED HANDLING AND STORAGE**	
7.14	MPI107.D1	Unit D Topic 1	Automated material handling systems	CO 4
7.15	MPI107.D2	Unit D Topic 2	AS/RS	CO 4
7.16	MPI107.D3	Unit D Topic 3	Carousel storage	CO 4
7.17	MPI107.E	**Unit E**	**INSPECTION METHODS**	
7.18	MPI107.E1	Unit E Topic 1	Contact methods	CO 5
7.19	MPI107.E2	Unit E Topic 2	Non- contact methods	CO 5
7.20	MPI107.E3	Unit E Topic 3	Automated Inspection	CO 5

8	**Course Evaluation**			
8.1	Course work: 25%			
8.11	Mode of examination	Theory		
8.12	Weightage Distribution	CA	MTE	ETE
		25%	25%	50%
8.2	MTE	One, 25 percent		
8.3	End-term examination: 50 marks			
9.1	Text book	1. Mikell P.Groover, "Automation, Production Systems and Computer Integrated Manufacturing," PHI, 1995.		
9.2	Other References	1. Weatherall, "Computer Intergrated Manufacturing: A Total Company Strategy," 2nd edition, 1995. 2. Ronald G. Askin, "Modeling and analysis of Manufacturing Systems," John Wiley & Sons, 1993.		

Programme Outcome Vs Courses Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MPI107.1	2	-	-	-	-	-	-	-	-	-
MPI107.1.2	2	1	1	-	-	-	-	-	-	-
MPI107.1.3	2	1	-	-	2	-	-	-	-	-
MPI107.1.4	2	-	-	-	2	-	-	-	-	-
MPI107.1.5	2	1	-	-	2	-	-	-	-	-
MPI107.1.6	2	2	-	-	2	-	-	2	-	-
MPI107	2	1	1	-	2	-	-	2	-	-

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

School: SSET		**Batch : 2024-2026**	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: I**	
1	**Course Code**	MME104	
2	**Course Title**	Advanced Material Engineering	
3	**Credits**	3	
4	**Contact Hours (L-T-P)**	3-0-0	
	Course Status	Program Core	
5	**Course Objective**	1. Provide an understanding of the importance of materials in engineering 2. Develop knowledge of traditional and advanced materials used in engineering industries. 3. Provide students an understanding of latest developments and future directions in materials engineering 4. Develop knowledge of manufacturing methods of various engineering materials 5. Develop an understanding of properties and applications of various engineering materials. 6. Learn effectively for the purpose of continuing professional development and in a wider context throughout their career	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1::Identify the various crystal structure and classify the advanced materials CO2: Discuss the characteristics and uses of polymers CO3: Analyze the unique properties and applications of ceramic materials CO4: Apply the principles of various mechanical testing on advanced engineering materials. CO5: Compile the list of composite materials for engineering applications based on the knowledge of its behaviour. CO6: Identify appropriate advanced materials for specific engineering applications	
7	**Course Description**	This course focuses on the understanding of different engineering materials, their significance in engineering, methods of manufacturing, properties and applications.	
8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Introduction**	
	A	Retrospective of materials science in Engineering; Classification and importance of materials, Traditional engineering materials	CO1
	B	Refresher of Miller indices for cubic and non-cubic systems.	CO1
	C	Modern engineering materials, Advanced materials, Biomaterials, Nano-materials, Future materials.	CO1
	Unit 2	**Polymers**	

	A	Definitions and types of polymers, Synthesis, processing and fabrication of polymers,			CO3, CO2
	B	Behaviour of polymers: Crystallization, melting, glass transition, Visco-elastic.			CO3,CO2
	C	mechanisms of deformation and strengthening; Applications in structural, electrical and functional domains			CO3,CO2
	Unit 3	**Ceramics**			
	A	Definitions and types of ceramics, Traditional and Advanced Ceramics,			CO4
	B	Synthesis, Processing and fabrication of ceramics.			CO4
	C	Fracture mechanics of structural ceramics, Applications in structural, electrical and functional domains.			CO4
	Unit 4	**Composites**			
	A	Elastic behaviour of composites, anisotropic elasticity; orthotropic elasticity			CO5, CO2
	B	Definition of composites, Elastic behaviour of composites; Types of matrices, reinforcement and interfaces;			CO5,CO2
	C	Types of composites: PMCs, MMCs, CMCs, IMCs, SMCs and Nano-composites; Applications in natural, biological, structural and functional systems.			CO5,CO2
	Unit 5	**Applications of Advanced materials**			
	A	Application of polymer material in structural, electrical and functional domains			CO6
	B	Application of ceramics material in structural, electrical and functional domains			CO6
	C	Application of composite in natural, biological, structural and functional systems.			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	
	Text book/s*	1. Callister'S Materials Science And Engineering: Indian Adaptation (W/Cd), by R.Balasubramaniam, Wiley India 2. Material Science and Engineering: W. F Smith, Hashmi and Ravi Prakash, McGraw Hill.			
	Other References	**1.** Introduction to Polymers, Robert J. Young, Peter A. Lovell, CRC Press. **1.** Introduction to Ceramics, W. David Kingery, H. K. Bowen, Donald R. Uhlmann, John Wiley & Sons. **3.** Composite Materials: Science and Engineering, Krishan Kumar Chawla, Springer. **4.** Biomaterials Science: An Introduction to Materials in Medicine, Buddy D. Ratner, Academic Press			

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME104.1	2	1	2	3	2	-	-	2	-	-
MME104.2	2	2	2	3	2	-	-	2	-	-
MME104.3	2	3	2	3	2	-	-	2	-	-
MME104.4	2	3	2	3	2	-	-	2	-	-
MME104.5	2	2	2	3	2	-	-	2	-	-
MME104.6	2	2	2	3	2	-	-	2	-	-
MME104	2	2	2	3	2	-	-	2	-	-

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

School: SSET		**Batch : 2024-2026**	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: I**	
1	**Course Code**	MPI 160	
2	**Course Title**	Design and Modelling Tool Lab	
3	**Credits**	2	
4	**Contact Hours (L-T-P)**	0-0-4	
	Course Status	Practical	
5	**Course Objective**	This course is to impart fundamental knowledge to students on using Computer Aided Design and analysis software. Also to aware the students on how these tools are used in Industries in solving the real time problems.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Construct basic 2D sketch and part model by using draw, modify and power tools in Solidworks. CO2: Construct assembly and drawing of machine elements using Solidworks. CO3: Analyse normal stress distribution in various mechanical components using Solidworks CO4: Analyse thermal stresses of a mechanical component using Solidworks CO5: Simulate a mechanical system using Solidworks software.	
7	**Course Description**	The course provides an in-depth understanding and skill of constructing 2-D drawings using well-known commercial CAD package, and integrating 3-D solid modeling techniques into simulation, and analysis animation of new designs using commercial CAD software. The students will have hands-on experience to create and assemble the components, analyse Structure, by using several different software packages.	
8	**Outline syllabus**		**CO Mapping**
	List of Experiments		
	Experiment 1	Introduction to Solidworks and working with sketch mode	CO1

	Experiment 2	Working with creating features (Extrude & Revolve), Working Datum Planes	CO1
	Experiment 3	Working with advanced modeling tools (Sweep, Blend, Variable section Sweep, Swept Blend & Helical Sweep)	CO1
	Experiment 4	Creating Machine component by part modelling feature in solidworks	CO1, CO2
	Experiment 5	Creating assembly of engine component in solidworks	CO2
	Experiment 6	Creating exploded views and drawing of an assembly in solidworks	CO2
	Experiment 7	Creating assembly of flanged coupling in solidworks	CO2
	Experiment 8	Introduction about the various analysis features in solidworks.	CO3, CO4
	Experiment 9	Force analysis of a beam by in Solidworks	CO4, CO5
	Experiment 10	Thermal analysis of Pin-Fin in Solidworks	CO4, CO5
	Mode of examination	Practical	
	Weightage Distribution	CA: 25%, CE: 25%, ETE: 50%	
	Text book/s*	1. Thermal Analysis with SOLIDWORKS Simulation 2018 and Flow Simulation 2018 by Paul Kurowski	
	Software	Solidworks	

Programme Outcome Vs Courses Mapping Table:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MPI160.1	2	2	-	-	2	-	-	3	2	2
MPI160.2	2	2	2	2	2	-	-	3	2	2
MPI160.3	2	2	2	2	2	-	-	3	2	2
MPI160.4	2	2	2	2	2	-	-	3	2	2
MPI160.5	2	2	2	2	2	-	-	3	2	2
MPI160	2	2	2	2	2	-	-	3	2	2

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

School: SSET		**Batch : 2024-2026**	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: II**	
1	**Course Code**	MPI 115	
2	**Course Title**	**Computer Integrated Manufacturing Systems Lab**	
3	**Credits**	1	
4	**Contact Hours (L-T-P)**	0-0-2	
	Course Status	Practical	
5	**Course Objective**	To impart knowledge about the integration of interdisciplinary fields of computer aided design, computer aided manufacturing. Undergoing this lab the students will learn to use the CNC machines efficiently for manufacturing desired products and knowledge of programming and use of CNC tooling.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO 1 Acquire knowledge on how to prepare program in CNC Machine. CO 2 – Impart knowledge on how to prepare program in CNC turning machine CO 3 – Prepare a turned sample operate CNC turning machine CO 4 – Apply software for simulation of milled parts in CNC CO 5 – Infer on how to prepare program in CNC milling machine CO 6 - Apply the concepts of machining and select appropriate cutting tools for CNC milling and turning equipment, set-up, program, and operate CNC milling and turning equipment.	
7	**Course Description**	This course will help to develop Programming skills and crate an component for required drawing, Simulate the prepared part programme using available simulation software's. and prepare the parts on CNC machines.	
8	**Outline syllabus**		**CO Mapping**
	Experiment 1	To study the operational procedure for CNC turning and milling.	CO1
	Experiment 2	Develop a CNC program for step turning and simulate	CO2, CO3
	Experiment 3	Develop a CNC program for taper turning and simulate	CO2, CO3

	Experiment 4	Develop a part program for linear feature and simulate on CNC Milling		CO4, CO5
	Experiment 5	Develop a part program for circular interpolation and simulate on CNC milling.		CO4, CO5
	Experiment 6	Develop a part program for drilling and simulate on CNC milling.		CO5, CO6
	Experiment 7	To write a program to perform the Circular pocketing operation on the given work piece.		CO5, CO6
	Mode of examination	Practical		
	Weightage Distribution	CA	CE	ETE
		25%	25%	50%
	Text book/s*	1. CAD/CAM: computer aided design and manufacturing by Groover Mikell P, Zimmer W Emory 2. Computer Numerical Control-Turning and Machining centers by Quesada Robert		
	Reference	Manuals provided in the lab		

Programme Outcome Vs Courses Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MPI115.1	1	2	-	-	-	-	-	2	1	-
MPI115.2	3	-	3	3	-	1	-	3	-	2
MPI115.3	2	2	2	2	-	-	2	3	-	2
MPI115.4	1	-	3	3	-	-	-	2	2	2
MPI115.5	3	3	-	1	-	2	-	2	3	-
MPI115.6	2	2	2	2	-	1	-	2	-	2
MPI115	2	2	3	2	-	2	1	2	1	2

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

School: SSET		**Batch: 2024-2026**	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: II**	
1	**Course Code**	MRM001	
2	**Course Title**	Research Methodology	
3	**Credits**	2	
4	**Contact Hours (L-T-P)**	2-0-0	
	Course Status	Program Elective	
5	**Course Objective**	• Develop understanding of the basic framework of research process. • Develop an understanding of various research designs and techniques. • Identify various sources of information for literature review and data collection. • Develop an understanding of the ethical dimensions of conducting applied research. • Appreciate the components of scholarly writing and evaluate its quality.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Understand the mindset 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: Understand 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**		**CO Mapping**
	Unit 1	**Introduction**	
	A	Introduction to research – The role of research, research process overview	CO1
	B	Philosophies and the language of research theory building – Science and its functions, What is theory?, and The meaning of methodology	CO1,CO2

	C	Thinking like a researcher – Understanding Concepts, Constructs, Variables, and Definitions	CO1,CO2
	Unit 2	**Research Problem and Hypotheses**	
	A	Defining the research problem, The importance of problems	CO2,CO3
	B	Formulation of the research hypotheses, The importance of hypothesis	CO2,CO3
	C	Experimental and Non-experimental research design	CO2,CO3
	Unit 3	**Data Collection**	
	A	Field research, and Survey research	CO4,CO5
	B	Methods of data collection– Secondary data collection methods	CO4,CO5
	C	Methods of data collection– qualitative methods of data collection, and Survey methods of data collection	CO4,CO5
	Unit 4	**Data Analysis**	
	A	Attitude measurement and scaling – Types of measurement scales; Questionnaire designing – Reliability and Validity	CO5,CO6
	B	Sampling techniques – The nature of sampling, Probability sampling design, Non-probability sampling design, Determination of sample	CO5,CO6
	C	Processing and analysis of data	CO5,CO6
	Unit 5	**Report Writing**	
	A	Ethical issues in conducting research	CO6
	B	Report generation and report writing	CO6
	C	APA format – Title page, Abstract, Introduction, Methodology, Results, Discussion, References, and Appendices	CO6
	Mode of examination		
	Weightage Distribution	CA: 25% / MTE: 25% / ETE: 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.	

Programme Outcome Vs Courses Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MRM001.1				1						1
MRM001.2		1	1	1						2
MRM001.3		1		1				2		2
MRM001.4		1		1	1					1
MRM001.5		1		1				2	1	1
MRM001.6		1	1	2	1			2	1	2
MRM001	-	1	1	1	1	-	-	2	1	2

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

School: SSET		**Batch : 2024-2026**
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: II**
1	**Course Code**	**MPI786**
2	**Course Title**	Experimental Design and Analysis Lab
3	**Credits**	2
4	**Contact Hours (L-T-P)**	0-0-4
	Course Status	Practical
5	**Course Objective**	The objective of this course is to impart students a holistic view of the fundamentals of experimental designs, analysis tools and techniques, interpretation, applications using experimental design and analysis software.
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Explain the fundamentals and applications of design of experiments. CO2: Utilize basic statistics including ANOVA and regression using Minitab/ DX7/R CO3: Apply the experimental designs such as RCBD, BIBD, Latin Square in practical problems using Minitab/DX7/R CO4: Apply factorial and fractional factorial designs in practical problems using Minitab/DX7/R software depending upon the availability of resources CO5: Construct statistical models, analyse the experimental data and results interpretation using Minitab/ DX7/R CO6: Analyze response of interest from an experimental data by using RSM/Taguchi using Minitab/ DX7/R
7	**Course Description**	This course demonstrates the formal, structured method for conducting single and multifactor experiments, modelling and optimization of process parameters. This course discusses about the integration of modern statistical software in real-world problems and case studies, and illustrates the efficacy of different experimental designs across the industries.

8	**Outline syllabus**		**CO Mapping**
	List of Experiments		
	Experiment 1	Perform a full DOE test matrix, in both randomized and blocked way. Build a model for the given exercise.	CO1,CO2
	Experiment 2	Exercise on multi-factor factorial design 1. Two factor factorial design 2. Three factor factorial design	CO2, CO4
	Experiment 3	Exercise on general two factor factorial design and blocking in 2^k factorial design	CO2, CO4

	Experiment 4	Analyze and interpret the Taguchi's orthogonal designs and S/N ratio			CO5,CO6
	Experiment 5	Exercise on robust parameter design			CO5, CO6
	Experiment 6	Exercise on response surface design analysis 1. CCD 2. BBD			CO5, CO6
	Mode of examination	Practical			
	Weightage Distribution	CA	CE	ETE	
		25%	25%	50%	
	Softwares	DesignExpert, MINITAB, MATLAB			
	Text book/s*	1. Montgomery, D.C. (2009). Design and Analysis of Experiments. 2. Box, G.E.P., Hunter, J.S. and Hunter, W.G. (2005). Statistics for Experimenters. 3. Myers, R.H., Montgomery, D.C. and Anderson-Cook, C.M. (2009). Response Surface.			

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MPI786.1	2	2	-	-	2	-	-	2	-	-
MPI786.2	2	2	1	-	2	-	-	2	-	-
MPI786.3	2	-	3	-	2	-	-	2	-	-
MPI786.4	2	-	2	2	2	-	-	2	-	-
MPI786.5	3	-	2	-	2	-	-	2	-	-
MPI786.6	2	1	2	2	3			2		
MPI786	2	1	2	2	2	-	-	2	-	-

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

School: SSET		Batch : 2024-2026
Programme: M.Tech Batch: ME		**Current Academic Year: 2024-2025**
1	**Course Number**	CCU101
2	**Course Title**	Community Connect
3	**Credits**	2
3.01	**(L-T-P)**	0-0-4
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**	After the successful completion of course, students will be able to: CO1. Understand and acquire 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 11. 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.

<table>
<tr><td></td><td></td><td>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.</td></tr>
<tr><td>8.2</td><td>Role of CCC-Coordinator</td><td>The CCC Coordinator will supervise the whole process and assign students to faculty members.</td></tr>
<tr><td>8.3</td><td>Layout of the Report</td><td>Abstract (250 words)
Introduction
Literature review(optional)
Objective of the research
Research Methodology
Finding and discussion
Conclusion and recommendation
References
Note: Research report should base on primary data.</td></tr>
<tr><td>8.4</td><td>Guideline for Report Writing</td><td>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.</td></tr>
<tr><td>8.5</td><td><u>Format:</u></td><td>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</td></tr>
</table>

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**	**50%**
	Noting responses to the questionnaire	**20 Marks**
	Data analysis and Report Writing	**40 Marks**
9.02	**ETE (PPT presentation)**	**50%**

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CCU101.1	2	1	1	1	-	1	2	-	-	-
CCU101.2	2	1	1	1	-	1	2	-	-	-
CCU101.3	2	1	1	1	-	1	2	-	-	-
CCU101.4	2	1	1	1	-	1	2	-	-	-
CCU101.5	2	1	1	1	-	2	2	-	-	-
CCU101.6	2	1	1	1	-	1	2	-	-	-
CCU101	2	1	1	1	-	1	2	-	-	-

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

School: SSET		Batch : 2024-2026	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: II**	
1	**Course Code**	MPI 788	
2	**Course Title**	Automation lab	
3	**Credits**	1	
4	**Contact Hours (L-T-P)**	0-0-2	
	Course Status	Practical	
5	**Course Objective**	To understand the basic concepts of automation and robotics and different industrial application of PLC, CNC and Robot. The purpose of this laboratory is to train the students to be familiar with the software and hardware of PLC so that they can gain enough experiences to meet the demand of the automation era.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1- Analyze the surface roughness using specific equipment CO2 - Study and analyze the CNC programming for different kind of machining and operation CO3 - Analyze the performance of Pick and Place robot by Teach Pendant Method CO4 – Demonstrate and Analyze different PLC application CO 5 - Study and analyze the controller of DC motor. CO6- Describe the working principles of various types of transducers and image processing techniques.	
7	**Course Description**	The objective of this laboratory enables the students to build a firm background in PLC hardware as well as software. Students learn about ladder logic programming, wiring different I/O's (analog and digital) with PLC programming. They acquire the practical skills sufficient to design and realize basic automation process.	
8	**Outline syllabus**		**CO Mapping**
	List of Experiments		
	Experiment 1	Measurements of Surface roughness, Using Tally Surf / Mechanical Comparator	CO1
	Experiment 2	Develop the CNC program for grooving, drilling and boring a job of given dimension according to the specified dimensions using CNC Lathe.	CO2
	Experiment 3	Pick and place operation of Robot in Teach Pendent method	CO3
	Experiment 4	PLC Application Trainer	CO4
	Experiment 5	PLC Controlled Material Handling System	CO4
	Experiment 6	Speed control of DC motor.	CO5

	Experiment 7	Study of various types of transducers.			CO6
	Experiment 8	Study of image processing technique.			CO6
	Experiment 9	Measurements of Surface roughness, Using Tally Surf / Mechanical Comparator			CO1
	Experiment 10	Develop the CNC program for grooving, drilling and boring a job of given dimension according to the specified dimensions using CNC Lathe.			CO2
	Mode of examination	Practical			
	Weightage Distribution	CA	CE	ETE	
		25%	25%	50%	
	Text book/s*	Book by A. K. Gupta, Jean Riescher Westcott, and Satish Kumar Arora			
	Software	Manuals provided in the lab			

Programme Outcome Vs Courses Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MPI788.1	3	-	-	3	2	-	-	-	3	-
MPI788.2	2	-	-	3	2	-	-	-	3	-
MPI788.3	3	-	-	3	2	-	-	-	3	-
MPI788.4	2	-	-	3	2	-	-	-	3	-
MPI788.5	2	-	-	3	2	-	-	-	3	-
MPI788.6	3	-	-	-	-	-	-	-	3	-
MPI788	3	-	-	3	2	-	-	-	3	-

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

School: SSET		**Batch : 2024-2026**
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: III**
1	Course Code	**MME693**
2	Course Title	**Dissertation I**
3	Credits	10
4	Contact Hours (L-T-P)	N/A
	Course Status	Dissertation
5	Course Objective	The M.Tech Dissertation I course is an expansion of past work in the field or an improvement to the existing state-of-the-art which is expected to contribute something new to the field with proper proof and analysis.
6	Course Outcomes	After the successful completion of course, students will be able to: CO1: Identify the recent research articles relevant to the area of specialization. CO2: Select the appropriate research topic considering society, environment and ethics. CO3: Choose the problem statement and objectives from the identified gaps and lacuna. CO4: Identify the methodology to carry out the experiments towards significant findings. CO5: Analyze the experimental data of the conducted study. CO6: Summarize the work as per the recommended format and defend the work.
7	Course Description	This course is an expansion of past work in the field or an improvement to the existing state-of-the-art which is expected to contribute something new to the field with proper proof and analysis.
	Mode of examination	Thesis and Viva-Voce
	Weightage Distribution	CA: 50%, ETE: 50%
	Text book/s*	As per the field/specialization
	http:/	Google scholar, Science direct, ASME, Taylor and Francis, IEEE

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME693.1	3	3	2	-	-	-	2	1	1	2
MME693.2	3	3	2	-	2	-	2	1	1	2
MME693.3	3	3	2	-	2	-	2	1	1	2
MME693.4	3	3	2	-	2	-	2	2	1	2
MME693.5	3	3	2	-	2	-	2	2	1	2
MME693.6	3	3	2	-	-	-	-	-	-	-
MME693	3	3	2	-	2	-	2	1	1	2

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

School: SSET		**Batch : 2024-2026**
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: IV**
1	**Course Code**	**MME694**
2	**Course Title**	**Dissertation II**
3	**Credits**	16
4	**Contact Hours (L-T-P)**	N/A
	Course Status	Dissertation
5	**Course Objective**	The M.Tech Dissertation II course is an expansion of past work in the field or an improvement to the existing state-of-the-art which is expected to contribute something new to the field with proper proof and analysis.
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Identify the methodology to carry out the experiments towards significant findings. CO2: Develop the procedures for carrying out the experiments with a concern for society, environment and ethics. CO3: Analyze and discuss the results to draw valid conclusions from the work CO4: Summarize the work as per the recommended format and defend the work. CO5: Find the possibility for publishing the work in peer reviewed journals/conference proceedings. CO6: Identify the future scope of the conducted study.
7	**Course Description**	This course is an expansion of past work in the field or an improvement to the existing state-of-the-art which is expected to contribute something new to the field with proper proof and analysis.

	Mode of examination	Thesis and Viva-Voce		
	Weightage Distribution	CA	ETE	
		50%	50%	
	Text book/s*	As per the field/specialization		
	http:/	Google scholar, Science direct, ASME, Taylor and Francis, IEEE		

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME694.1	3	3	2	-	-	-	2	1	1	2
MME694.2	3	3	2	-	2	-	2	1	1	2
MME694.3	3	3	2	-	2	-	2	1	1	2
MME694.4	3	3	2	-	2	-	2	2	1	2
MME694.5	3	3	2	-	2	-	2	2	1	2
MME694.6	3	3	2	-	-	-	-	-	-	-
MME694	3	3	2	-	2	-	2	1	1	2

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

School: SSET		**Batch : 2024-2026**
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: I**
1	**Course Code**	MME 122
2	**Course Title**	Finite Element Method with MATLAB
3	**Credits**	3
4	**Contact Hours (L-T-P)**	3-0-0
	Course Status	Program Elective
5	**Course Objective**	This course provides an introduction to Finite Element Method with a focus on 1D and 2D problems in structures, heat transfer, static and dynamics as well as writing algorithm for problem solving using MATLAB
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Formulate the basic principles of elasticity, equilibrium, energy and virtual work. CO2: Formulate the finite element characteristics for solving complex structural and thermal problems CO3: Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer CO4: Analyse the various static and dynamic structural problems by formulating appropriate finite element method. CO5: Analyse the various fluid and heat transfer problems by formulating appropriate finite element method. CO6: Solve the complex engineering problem based on finite element formulations using MATLAB.
7	**Course Description**	This course introduces finite element methods for the analysis of solid, structural, fluid and heat transfer problems. Applications of finite element methods, modelling and analysis of problems, and interpretation of numerical results.

8	Outline syllabus		CO Mapping
	Unit 1	**Introduction**	
	A	Review of elasticity, mathematical models for structural problems,	CO1
	B	Equilibrium of continuum-Differential formulation	CO1
	C	Energy Approach-integral formulation, Principle of virtual work-Variational formulation.	CO1
	Unit 2	**Finite element formulation**	
	A	Philosophy and general processes of finite element method.	CO2, CO6
	B	Concept of discretisation and Interpolation.	CO2, CO6
	C	Formulation of finite element characteristic matrices and vectors, Compatibility, Assembly and boundary condition.	CO2, CO6
	Unit 3	**Analysis of one dimensional Structural problems**	

	A	Formulation of stiffness matrix, mass matrices and lumped load vectors.	CO4, CO6, CO3
	B	Introduction to higher order elements and their advantages and disadvantages	CO4, CO6, CO3
	C	Static and dynamic analysis of one dimensional axial and beam problems	CO4, CO6, CO3
	Unit 4	**Analysis of Two dimensional Structural Problems:**	
	A	Shape functions in two dimensions, natural coordinates, Isoparametric representation, Concept of Jacobian.	CO4, CO6, CO3
	B	Triangular and Quadrilateral elements for membrane elements.	CO4, CO6, CO3
	C	Quadrilateral elements for plate bending elements	CO4, CO6, CO3
	Mode of examination	Theory	
	Weightage Distribution	CA	MTE
		25%	25%
	Text book/s*	Seshu P, Textbook of Finite Element Analysis, PHI. 2004	
	Other References	1 Reddy, J.N., Finite Element Method in Engineering, Tata McGraw Hill, 2007. 2. Singiresu S.Rao, Finite element Method in Engineering, 5ed, Elsevier, 2012 3. Zeincowicz, The Finite Element Method for Solid and Structural Mechanics, 4th Edition, Elsevier 2007. 4. Young W Kwon and Hyochoong Bang, The finite element method using MATLAB, 2ed, CRC Press, London. 2000.	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME122.1	3	1	1	-	-	-	-	1	2	3
MME122.2	3	2	1	-	-	-	-	1	2	3
MME122.3	3	3	3	-	-	-	-	1	2	3
MME122.4	3	3	3	-	-	-	-	1	2	3
MME122.5	3	3	3	-	-	-	-	1	2	3
MME122.6	3	3	3	-	-	-	-	1	2	3
MME122	**3**	**3**	**3**	-	-	-	-	**1**	**2**	**3**

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

School: SSET		Batch : 2024-2026
Programme: M.Tech		Current Academic Year: 2024-2025
Branch: ME		Semester: I
1	**Course Code**	MMP 122
2	**Course Title**	Finite Element Method with MATLAB Lab
3	**Credits**	1
4	**Contact Hours (L-T-P)**	0-0-2
	Course Status	Program Elective
5	**Course Objective** This course provides an introduction to Finite Element Method with a focus on 1D and 2D problems in structures, heat transfer, static and dynamics as well as writing algorithm for problem solving using MATLAB	
6	**Course Outcomes** After the successful completion of course, students will be able to: CO1: Formulate the basic principles of elasticity, equilibrium, energy and virtual work. CO2: Formulate the finite element characteristics for solving complex structural and thermal problems CO3: Apply finite element method to solve problems in solid mechanics, fluid mechanics and heat transfer CO4: Analyze the various static and dynamic structural problems by formulating appropriate finite element method. CO5: Analyze the various fluid and heat transfer problems by formulating appropriate finite element method. CO6: Solve the complex engineering problem based on finite element formulations using MATLAB.	
7	**Course Description** This course introduces finite element methods for the analysis of solid, structural, fluid and heat transfer problems. Applications of finite element methods, modelling and analysis of problems, and interpretation of numerical results.	
8	Outline syllabus	

List of Experiments		CO Mapping
Experiment 1	Introduction to interface of MATLAB limited to use of finite element formulation and analysis.	CO6
Experiment 2	Formulation of finite element simulation of static and dynamic responses of uniform rod using MATLAB.	CO3,CO4,CO6
Experiment 3	Computation of finite element simulation of static and dynamic responses of uniform beam using MATLAB	CO3,CO4,CO6
Experiment 4	Formulation of finite element simulation of static analysis of uniform rectangular plate using MATLAB.	CO3,CO4,CO6
Experiment 5	Formulation of finite element simulation of dynamic analysis of uniform rectangular plate using MATLAB.	CO3,CO4,CO6

	Experiment 6	Computation of finite element simulation of buckling analysis of uniform beam subjected to axial load using MATLAB	CO3,CO4,CO6
	Experiment 7	Formulation of finite element simulation of buckling analysis of uniform rectangular plate subjected to in-plane loading using MATLAB.	CO3,CO4,CO6
	Experiment 8	Computation of finite element simulation dynamic analysis of rotating uniform beam using MATLAB	CO3,CO4,CO6
	Experiment 9	Formulation of finite element simulation of heat transfer problem of uniform rod using MATLAB.	CO3,CO5,CO6
	Experiment 10	Computation of finite element simulation dynamic analysis of tapered beam using MATLAB	CO3,CO4,CO6
	Mode of examination	Practical	
	Weightage Distribution	CA: 25%, CE: 25%, ETE: 50%	
	Text book/s*	1. Young W Kwon and Hyochoong Bang, The finite element method using MATLAB, 2ed, CRC Press, London. 2000.	
	Software	MATLAB	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MMP 122.1	3	1	1	-	-	-	-	1	2	2
MMP 122.2	3	2	1	-	-	-	-	1	2	2
MMP 122.3	3	3	3	-	-	-	-	1	2	2
MMP 122.4	3	3	3	-	-	-	-	1	2	2
MMP 122.5	3	3	3	-	-	-	-	1	2	2
MMP 122.6	3	3	3	-	-	-	-	1	2	2
MMP 122	**3**	**3**	**3**	-	-	-	-	**1**	**2**	**3**

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

School: SSET		**Batch : 2024-2026**
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: I**
1	**Course Code**	MME112
2	**Course Title**	Advanced Manufacturing Techniques
3	**Credits**	3
4	**Contact Hours (L-T-P)**	3-0-0
	Course Status	Program Elective
5	**Course Objective**	1. To present the fundamentals of advanced manufacturing techniques 2. To prepare students to apply their understanding of advanced manufacturing processes based on Mechanical, Chemical & Electro-Thermal Energy.
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Analyze the characteristics of Ultrasonic machining, Abrasive jet machining and water jet machining. CO2: Explain various chemical processes in advance manufacturing techniques. CO3: Classify non-traditional manufacturing processes according to the source of energy. CO4: Elaborate the various HERF process. CO5: Discuss various advanced casting processes. CO6: Determine the various advance machining processes.
7	**Course Description**	This course introduces students to learn about various non-conventional machining process. These processes are generally used when traditional methods are not technically or economically feasible like machining of very hard or tough materials, machining of very complex shapes and to obtain high surface finish and accuracy in manufacturing process.

8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Advanced Machining Process (Mechanical)**	
	A	Introduction, Need of advanced manufacturing processes,	CO1,CO2
	B	Mechanical machining, Types - Ultrasonic machining (USM), Abrasive Jet Machining (AJM), Parametric Analysis of USM & AJM.	CO1,CO3
	C	Water Jet Machining (WJM). Operating principle, Process parameters, Applications & Limitations. Introduction to micromachining	CO1,CO3
	Unit 2	**Advanced Machining Process(Chemical)**	
	A	Electro chemical machining, Chemical material removal, its types.	CO4

	B	Electro chemical machining (ECM), Operating principle			CO4
	C	Process parameters, Applications & Limitations.			CO4
	Unit 3	**Advanced Machining Process (Electro-Thermal)**			
	A	Thermo electrical machining, Types, Electrical discharge machining (EDM), Electrical discharge wire cutting (EDWC).			CO4
	B	Electron beam machining (EBM), Operating principle, Process parameters, Applications & Limitations			CO4
	C	Laser materials processing, Laser types, Processes. Laser beam machining (LBM), Applications – Limitations			CO5
	Unit 4	**High Energy Rate Forming**			
	A	Introduction to HERF			CO6
	B	Explosive forming, Hydro-forming.			CO6
	C	Electro hydraulic forming, Electromagnetic forming			CO6
	Unit 5	**Advanced Casting Processes**			
	A	Pressure Die Casting, Vacuum die casting,			CO6
	B	Centrifugal casting, Shell mould casting, Investment casting			CO6
	C	Introduction to Powder metallurgy and its application.			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	
	Text book/s*	1. Pandey,P.C and Shan, H.S. , “Modern Machining Process”, 2014.			
	Other References	2. Ghosh, A. and Mallik, A.K. , “Theory of Mechanisms and Machines”, 1988. 3. P K Mishra, "Non-Conventional Machining", Narosa India Publication, a Text Book", 2007 4. Abdel, H. and El-Hofy, G. “Advanced Machining Processes”, McGraw-Hill, USA, 2005			

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME112.1	2	1	2	3	2	-	-	2	-	2
MME112.1.2	3	2	2	3	2	-	-	2	-	2
MME112.1.3	3	3	2	3	2	-	-	2	-	2
MME112.1.4	3	3	2	3	2	-	-	2	-	2
MME112.1.5	3	2	2	3	2	-	-	2	-	2
MME112.1.6	3	2	2	3	2	-	-	2	-	2
MME112	3	2	2	3	2	-	-	2	-	2

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

School: SSET		Batch: 2024-2026	
Programme: M.Tech		Current Academic Year: 2024-2025	
Branch: ME		Semester: I	
1	**Course number**	MME114	
2	**Course Title**	Industrial Robotics	
3	**Credits**	4	
4	**Contact Hours (L-T-P)**	3-1-0	
	Course Status	Program Elective	
5	**Course Objective**	1. Be familiar with the automation and brief history of robot and applications. 2. Give the student familiarities with the kinematic motion related to robots. 3. Give knowledge about robotic machine vision system. 4. Learn about Robot Manipulators and it's applications. 5. Give knowledge about Robot Planning, Installation and Safety Procedures.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: apply the knowledge of the automation and brief history of robot and applications. CO2: Analyze the kinematic motions of robot. CO3: classify about robotic grippers and their design concepts. CO4: Demonstrate machine vision system of robots. CO5: Explain the principles of various Sensors and their applications in robots. CO6: Create and analyze an industrial manipulator	
	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.	
7	**Outline syllabus**		**CO Mapping**
7.01	**Unit 1**	**Robotics Introduction**	
7.02	A	Evolution of Robots and Robotics, Laws of Robotics	CO1
7.03	B	Role of robotics in automated manufacturing system, Robot anatomy	CO1
7.04	C	Robot classifications and specifications, Manipulation and Control.	CO1
7.05	**Unit 2**	**Robot Kinematics & Gripper Mechanism**	
7.06	A	Robot kinematics, forward and reverse transformation,	CO2,CO6

		homogeneous transformations	
7.07	B	Fundamental Rotation matrices, Kinematic modeling of the manipulator, Denavit-Hartenberg Notation.	CO2,CO6
7.08	C	Robot end-effectors, mechanical, magnetic, and vacuum grippers, gripping forces RCC and design features of grippers.	CO2, CO3
7.09	**Unit 3**	**Robotic vision systems & Application of Robots**	
7.10	A	Robot vision and their interfaces, Machine Vision Applications	CO3, CO4
7.11	B	Applications of robots in materials handling, Inspection	CO3, CO4
ff7.12	C	Welding, spray painting and finish coating, Parts Mating & Parts Joining Operations.	CO3, CO4
7.13	**Unit 4**	**Robot Manipulators, Actuators and Drives**	CO3,C04
7.14	A	Types of Robot Manipulators, Application of Robot Manipulators, Construction of a Robot Manipulatotor	CO3,CO4
7.15	B	Characteristics of actuating systems, Comparison of actuating systems	CO4,CO6
7.16	C	Hydraulic Actuators , Pneumatic, Actuators, Electric Actuators, Robotic Drives	CO4,CO6
7.17	**Unit 5**	**Robot Sensors and Robot Safety**	
7.18	A	Sensors in Robotics, classification of Robotic sensors, Acoustic sensors Optical Sensors, Pneumatic Sensors.	CO5,CO6
7.19	B	Touch Sensors, Force Sensors, Force Sensing Wrist and its applications	CO5,CO6
7.20	C	Robot Planning and Installation, Robot Safety, Need of Robot Safety.	CO5,CO6

8	Course Evaluation			
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		25%	25%	50%
9	References			
9.1	Text book	1.Groover, M.P., "Industrial Robotic Technology - Programming and Application", McGrawhill		
9.2	Other references	**Reference Books and Monographs**		
		1. *Koren, Y. ,"Robotics for Engineers", McGrawhill.* 2. *Deb, S.R., "Robotics Technology and Flexible Automation" Tata Mc Graw Hill Elwood S Bufa and Rakesh K Sarin " Modern Production/Operations Management", Wiley India Edition, Reprint 2009*		

Programme Outcome Vs Courses Mapping Table:

POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME114.1	3	1	-	-	-	-	-	2	-	-
MME114.1.2	2	2	2	2	1	-	-	2	-	-
MME114.1.3	-	-	-	-	3	-	-	2	-	-
MME114.1.4	-	-	-	-	-	-	-	2	-	-
MME114.1.5	-	-	2	-	2	-	-	2	-	-
MME114.1.6	2	2	3	-	-	-	-	3	-	-
MME114	2	2	2	2	2	-	-	2	-	-

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

School: SSET		Batch: 2024-2026	
Programme: M.Tech		Current Academic Year: 2024-2025	
Branch: ME		Semester: I	
1	Course number	MPI 101	
2	Course Title	Production and Inventory Decisions	
3	Credits	3	
4	Contact Hours (L-T-P)	3-0-0	
5	Course Objective	The objective of PID 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 the successful completion of course, students will 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		**CO Mapping**
7.01	**Unit 1**	**INTRODUCTION**	
7.02	A	An Overview of production systems,	CO1
7.03	B	Production management objectives	CO1
7.04	C	Manufacturing strategy, Technological innovations in Manufacturing	CO1
7.05	**Unit 2**	**FORECASTING**	
7.06	A	The forecasting process	CO2
7.07	B	Monitoring and controlling the forecasting system	CO2
7.08	C	multi-item forecasting	CO2,CO6
7.09	**Unit 3**	**PLANNING ACTIVITIES**	
7.10	A	Aggregate Planning Strategies and methods	CO3, CO6

7.11	B	The Master Production Schedule,	CO3,CO6
ff7.12	C	Planning of material requirements - MRP, Manufacturing Resources Planning	CO3,CO6
7.13	**Unit 4**	**CONTROL ACTIVITIES**	
7.14	A	Capacity planning and control	CO4, CO6
7.15	B	Production Activity control, , Scheduling in Manufacturing,	CO4, CO6
7.16	C	Theory of constraints and synchronous manufacturing.	CO4, CO6
7.17	**Unit 5**	**INVENTORY MANAGEMENT**	
7.18	A	Basic Inventory systems, Inventory systems under risk,	CO5, CO6
7.19	B	Distribution inventory management,	CO5, CO6
7.20	C	Just - in - time systems and Lean manufacturing	CO5, CO6

8	Course Evaluation			
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		25%	25%	50%
8.2	MTE	One, 25 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** 2. *Seetharama L.Narasimhan,Dennis W.McLeavy,Peter J .Billington, ." Producion planning and inventory control ", PHI.* 3. *Averetle E Adam, Jr Ronaald J. Ebert "Production and operational management, PHI* 4. *Elwood S Bufa and Rakesh K Sarin " Modern Production/Operations Management", Wiley India Edition, Reprint 2009* 5. *Shailendra Kale, "Production and Operations Management", TMH Education*		

Programme Outcome Vs Courses Mapping Table:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MPI 101.1	-	-	-	-	1	-	-	2	-	2
MPI 101.1.2	-	-	-	2	-	-	-	2	-	2
MPI 101.1.3	2	2	3	2	2	-	-	2	-	2
MPI 101.1.4	-	-	-	-	-	-	1	2	1	2
MPI 101.1.5	-	-	-	-	-	-	1	2	1	2
MPI 101.1.6	2	2	2	2	2	-	-	2	-	2
MPI 101	2	2	2	2	2	-	1	2	1	2

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

SSET		**Batch : 2024-2026**	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: II**	
1	**Course Code**	MME118	
2	**Course Title**	Smart Manufacturing	
3	**Credits**	4	
4	**Contact Hours (L-T-P)**	4-0-0	
	Course Status	Program Elective	
5	**Course Objective**	1. Familiarize students with applications Of various quality control tools used in industrial engineering 2. Provide students an understanding of lean manufacturing process. 3. Teach the basics of Industry 4.O. 4.Teach students the basics of Industry 4.O applications in modern manufacturing industry.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Apply the basic concepts of quality engineering in industry. CO2: Illustrate the statistical process tools in an actual manufacturing plant. CO3: Explain the basic concepts of Lean manufacturing. CO4: Compare Internet of things and Industrial internet of things CO5: Elaborate the Industry4.O Applications in Manufacturing Industry. CO6: Identify the various quality management tools.	
7	**Course Description**	The objective of this course is to make the students realize about the various concepts of quality engineering, statistical tools, lean manufacturing and applications industry 4.O and IiOT. After learning this course the student will be able to implement all these techniques in an industry to help his as well as the industries growth in the market.	
8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Quality Tools**	CO1,CO5
	A	Benchmarking – Reasons to Benchmark, Benchmarking Process,	CO1
	B	Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function	CO1
	C	Total Productive Maintenance (TPM) – Concept, Improvement Needs,	CO1,CO5
	Unit 2	**Statistical Process Control**	CO1, CO2,CO6
	A	The seven tools of quality	CO1, CO2
	B	Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability	CO1, CO2
	C	Concept of six sigma, New seven Management tools.	CO1, CO6
	Unit 3	**Lean Manufacturing**	CO4

	A	Introduction to Lean Manufacturing, Industry Examples	CO4
	B	Lean Manufacturing Tools and Techniques, Overview of the Toyota Production System (TPS	CO4
	C	Lean Manufacturing Company Application, Lean Manufacturing Tools & Techniques application.	CO4
	Unit 4	**Industry 4.O**	CO3
	A	Concept of Internet of things, Industrial internet of things, IT & OT Convergence	CO3
	B	Requirements of Industry 4.0 concepts	CO3
	C	Virtual and Augmented reality in Industry4.O, Digital twins in Industrial IoT and Industry 4.O	CO3
	Unit 5	**Industry4.O Applications in Manufacturing Industry**	CO3
	A	Rise of Collaborative robot (COBOT), Edge Computing & IoT, Industrial Data Space.	CO3
	B	Logistics4.O, Industrial Iot gateways	CO3
	C	IioT Cybersecurity Risks and evolution, Iiot communication and connectivity technology, Maintenance and asset management with IioT.	CO3
	Mode of examination	Theory	
	Weightage Distribution	CA: 25% / MTE: 25% / ETE: 50%	
	Text book/s*	1. Industrial Engineering and Production Management- Martand Telsang-S.Chand & CO.	
	Other References	1. Samuel Eilon, "Elements of Production Planning and control", Universal Book Corp., 1999. **2.** Buffa, E.S., "Modern Production/Operations Management", John Wiley sons, 2003 **3.** Elsayed A Elsayed, Thomas O. Boucher, “Analysis and control of Production System”, Prentice Hall, 2002.	

Programme Outcome Vs Courses Mapping Table:

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME118. 1	2	-	-	1	2	-	-	2	-	2
MME118. 2	2	-	-	2	3	-	-	2	-	2
MME118. 3	1	1	-	1	--	-	-	2	-	2
MME118. 4	2	2	1	--	2	-	-	2	-	2
MME118. 5	1	2	1	1	2	-	-	2	-	2
MME118. 6	2	-	-	2	3	-	-	2	-	2
MME118	2	2	1	1	2	-	-	2	-	2

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

School: SSET	**Batch : 2024-2026**	
Programme: M.Tech	**Current Academic Year: 2024-2025**	
Branch: ME	**Semester: II**	
1	**Course Code**	MME015
2	**Course Title**	Supply Chain Management
3	**Credits**	4
4	**Contact Hours (L-T-P)**	4-0-0
	Course Status	Program Elective
5	**Course Objective**	1. Familiarize students with various drivers and metrics of supply chain management system 2. Provide students an understanding of different types of supply chain networks 3. Teach the basics of economics in supply chain management system 4. Teach students the basics of cross functional supply chain metrics
6	**Course Outcomes**	After the successful completion of course, students will 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**		**CO Mapping**
	Unit 1	**INTRODUCTION**	
	A	Understanding the Supply Chain	CO1
	B	Supply Chain Performance: Achieving Strategic Fit and Scope	CO1
	C	Supply Chain Drivers and Metrics	CO1
	Unit 2	DESIGNING THE SUPPLY CHAIN NETWORK	
	A	Designing Distribution Networks	CO2, CO6
	B	Network Design in the Supply Chain	CO2, CO6
	C	Network Design in an Uncertain	CO2, CO6

		Environment	
	Unit 3	PLANNING AND MANAGING INVENTORIES IN A SUPPLY CHAIN	
	A	Managing Economies of Scale in a Supply Chain: Cycle Inventory	CO3
	B	Managing Uncertainty in a Supply Chain: Safety Inventory	CO3
	C	Determining the Optimal Level of Product Availability	CO3
	Unit 4	DESIGNING AND PLANNING TRANSPORTATION NETWORKS	
	A	The Role of Transportation in a Supply Chain	CO4, CO6
	B	Modes of Transportation	CO4, CO6
	C	Trade-Offs in Transportation Design	CO4, CO6
	Unit 5	MANAGING CROSS-FUNCTIONAL DRIVERS IN A SUPPLY CHAIN	
	A	Sourcing Decisions in a Supply Chain	CO5, CO6
	B	Information Technology in a Supply Chain	CO5, CO6
	C	Coordination in a Supply Chain, Sustainability in SCM	CO5, CO6
	Mode of examination	Theory	
	Weightage Distribution	CA: 25% / MTE: 25% / ETE: 50%	
	Text book/s*	1. 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.	

Programme Outcome Vs Courses Mapping Table:

POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME015.1	2	-	-	-	3	-	2	-	-	-
MME015.1.2	-	-	3	-	3	2	-	-	-	-
MME015.1.3	-	-	-	-	3	-	-	1	3	1
MME015.1.4	2	-		2	-	-	-	-	-	-
MME015.1.5	-	-	-	-	3	1	-	-	-	-
MME015.1.6	2	2	3	3	2	-	3	-	-	2
MME015	2	2	3	2	3	1	2	1	3	2

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

<table>
<tr><td colspan="2">School: SSET</td><td colspan="2">Batch : 2024-2026</td></tr>
<tr><td colspan="2">Programme: M.Tech</td><td colspan="2">Current Academic Year: 2024-2025</td></tr>
<tr><td colspan="2">Branch: ME</td><td colspan="2">Semester: II</td></tr>
<tr><td>1</td><td>Course Code</td><td colspan="2">OEM 015</td></tr>
<tr><td>2</td><td>Course Title</td><td colspan="2">Renewable Energy and Energy Management</td></tr>
<tr><td>3</td><td>Credits</td><td colspan="2">3</td></tr>
<tr><td>4</td><td>Contact Hours (L-T-P)</td><td colspan="2">3-0-0</td></tr>
<tr><td></td><td>Course Status</td><td colspan="2">Open Elective</td></tr>
<tr><td>5</td><td>Course Objective</td><td colspan="2">1. To develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the areas of renewable energy.
2. to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the areas of non-conventional energy</td></tr>
<tr><td>6</td><td>Course Outcomes</td><td colspan="2">After the successful completion of course, students will be able to:
CO1.Identify the current worldwide energy usage and its impact on climate.
CO2.Compare the various renewable energy sources (solar, wind, hydro, wave, tidal and bio energy).
CO3.Design of windmills and its site selection
CO4.Create and utilize a biogas plant and classify the geothermal plants
CO5.Evaluate and construct energy management system
CO6.Develop a habit where energy conservation and energy management is a way of life.</td></tr>
<tr><td>7</td><td>Course Description</td><td colspan="2">This course provides opportunities for students to develop and demonstrate knowledge and understanding, qualities, skills and other attributes in the areas of renewable and non-conventional energy</td></tr>
<tr><td>8</td><td colspan="2">Outline syllabus</td><td>CO Mapping</td></tr>
<tr><td></td><td>Unit 1</td><td>Solar Energy</td><td></td></tr>
<tr><td></td><td>A</td><td>The sun as source of energy, direct solar energy utilization; solar thermal applications – water heating systems</td><td>CO1,CO2</td></tr>
<tr><td></td><td>B</td><td>space heating and cooling of buildings, solar cooking, solar ponds, solar green houses</td><td>CO2,</td></tr>
<tr><td></td><td>C</td><td>solar thermal electric systems; solar photovoltaic power generation; solar production of hydrogen</td><td>CO2</td></tr>
<tr><td></td><td>Unit 2</td><td>Energy from Oceans and Hydro Power</td><td></td></tr>
</table>

	A	Wave energy generation – energy from waves; wave energy conversion devices; advantages and disadvantages of wave energy			CO2, CO5
	B	Tidal energy – basic principles; tidal power generation systems; estimation of energy and power; advantages and limitations of tidal power generation; Ocean thermal energy conversion (OTEC)			CO2, CO5
	C	Methods of ocean thermal electric power generation. Classification of small hydro power (SHP) stations; description of basic civil works design considerations; turbines and generators for SHP; advantages and limitations			CO2, CO5
	Unit 3	**Wind Energy**			
	A	Basic principles of wind energy conversion			CO2,CO3
	B	Design of windmills; wind data and energy estimation			CO2, CO5
	C	Site selection considerations			CO5
	Unit 4	**Biomass and Geothermal Energy**			
	A	Energy plantation; biogas generation; types of biogas plants; applications of biogas; energy from wastes			CO1,CO5
	B	Origin and nature of geothermal energy; classification of geothermal resources			CO1,CO3
	C	schematic of geothermal power plants; operational and environments problems			CO5
	Unit 5	**Energy conservation management**			
	A	The relevance of energy management profession; general principles of energy management and energy management planning			CO1, CO5
	B	application of Pareto's model for energy management; obtaining management support; establishing energy data base; conducting energy audit;			CO6
	C	evaluating and implementing feasible energy conservation opportunities; energy audit report; monitoring, evaluating and following up energy saving measures/projects			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	
	Text book/s*	1. Non-Conventional Energy resources, B H Khan, Mc Graw Hill Companies. 2. Renewable Energy Sources and Emerging Tech, by D P Kothari, K C Singal and R Ranjan, EEE			
	Other References	1. 'Renewable energy resources'. John W Twidell and Anthony D Weir. 2. 'Renewable energy – power for sustainable future'. Edited by Godfrey Boyle. Oxford			

Programme Outcome Vs Courses Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
OEM015.1	3	2	2							1
OEM015.2	3	2	2							2
OEM015.3	3	2	1							2
OEM015.4	3	2	2			3				1
OEM015.5	3	2	2			2				2
OEM015.6	3	2	1							3
OEM 015	3	2	2	-	-	2	-	-	-	2

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

School: SSET		**Batch: 2024-2026**	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: II**	
1	**Course code**	MME127	
2	**Course name**	Advanced Operations Research	
3	**Credits**	4	
4	**Contact Hours (L-T-P)**	4-0-0	
5	**Course Objective**	The objective of this course is to provide a scientific basis to the managers of an organization for solving problems involving interaction of the components of the system, by employing a system approach by a team of experts drawn from different disciplines, for finding a solution which is in the best interest of the organisation as a whole.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Formulate and solve mathematical model (advanced linear programming problem) for a physical situations like production, distribution of goods and economics CO2: Apply Dynamic programming in real world practical problems. CO3: Demonstrate queuing theory and inventory management problems CO4: Design the best strategy using decision making methods under uncertainty and game theory. CO5. Develop cost effective solutions for network problems using PERT/CPM techniques. CO6. Compare various solutions applying decision making techniques for complex problems	
7	Outline syllabus		
7.01	**Unit 1**	**Advanced Topics in Operations Research**	**CO Mapping**
7.02	A	Formulation of Linear Programming Problems, Graphical solution	CO1
7.03	B	Simplex procedure for maximization and minimization, Duality concept	CO1,CO6
7.04	C	Integers Programming	CO1,CO6
7.05	**Unit 2**	**Dynamic Programming**	
7.06	A	Dynamic Programming Approach, Formulation of Dynamic Programming problems	CO2
7.07	B	Optimum solution of dynamic Problems	CO2
7.08	C	Application of dynamic Programming	CO2 ,CO6
7.09	**Unit 3**	**Queuing & Inventory Models**	
7.10	A	**Queuing Model:** Introduction, Kendall's notation, Classification of queuing models, Sequencing of n jobs and 2 & 3 machines, 2 jobs and m machines	CO3, CO6
7.11	B	**Inventory control:** Introduction, models of inventory,	CO3,CO6
7.12	C	fixed order quantity system, periodic quantity system EOQ model.	CO3,CO6
7.13	**Unit 4**	**Decision Theory and theory of games**	

7.14	A	Decision making under certainty and uncertainty,	CO4, CO6
7.15	B	Decision tree	CO4, CO6
7.16	C	Theory of games-definition, pure and mixed strategy, algebraic and graphical Methods.	CO4, CO6
7.17	**Unit 5**	**Network Models**	
7.18	A	Basic concept, Rules for drawing the network diagram,	CO5, CO6
7.19	B	Applications of CPM and PERT techniques.	CO5, CO6
7.20	C	Cost analysis and crashing the network	CO5, CO6

8	Course Evaluation			
8.1	Mode of examination	Theory		
8.11	Weightage Distribution	CA	MTE	ETE
		25%	25%	50%
8.3	End-term examination: 50%			
9	References			
9.1	Text book	1. Hira & Gupta, Operations Research, S. Chand & Co. New Delhi, 2007.		
9.2	Other references	1. Sharma,J.K., Operations Research: Theory and Application, McMillan India Publication. New Delhi, 3rd Edition. 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.		

Programme Outcome Vs Courses Mapping Table:

POS / COS	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME127.1	2	2	-	-	-	-	-	-	-	-
MME127.2	2	2	3	-	-	-	-	-	-	-
MME127.3	2	2	3	-	3	-	-	-	-	-
MME127.4	2	-	3	-	3	-	-	-	-	-
MME127.5	2	-	3	-	3	-	-	-	-	-
MME127.6	-	2	3	-	-	-	-	-	-	2
MME127	2	2	3	-	3	-	-	-	-	1

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

School: SSET		Batch : 2024-2026
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: II**
1	**Course Code**	MME121
2	**Course Title**	Mechanics of Composite Materials
3	**Credits**	3
4	**Contact Hours (L-T-P)**	3-0-0
	Course Status	Program Elective
5	**Course Objective**	1. Describe the characteristics and the manufacturing principles of composite laminates 2. Understand the micro-macro analyses of composite materials. 3. Perform hygro-thermo-elastic analyses for the determination of the stress and strain state in a multi-axial laminate 4. Understand the bending-twisting-extensional coupling in symmetrical and unsymmetrical laminates. 5. Establish the failure criteria for laminates based on failure of individual lamina in a laminate.
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Describe various types of composite materials and their manufacturing processes. CO2: Demonstrate an understanding of isotropic, transversely isotropic, orthotropic, and anisotropic material behaviour using generalized Hooke's law. CO3: Apply various micro-mechanics models to evaluate the macroscopic properties including stiffness and strength of the composites. : Demonstrate the fundamental building components for composite systems under hygrothermal environment. CO5: Analyze laminates using classical laminated plate theories and demonstrate an understanding of stacking sequence, lamina properties, ply orientation, and lamina geometric properties on stiffness of the laminate. CO6: Estimate the failure loads of the composite laminates subjected to various loading using various failure theories.
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. Basic knowledge of composites will allow

		engineers to understand the issues associated with using these materials, as well as gain insight into how their usage differs from metals, and ultimately be able to use composites to their fullest potential. 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 laminates.

8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Introduction**	
	A	Introduction to composite materials and its limitations	CO1
	B	Classifications of composite materials	CO1
	C	Manufacturing techniques for polymer, metal and ceramic matrix composite materials	CO1
	Unit 2	**Macro mechanical analysis of laminated composite materials**	
	A	Macro mechanical analysis of a lamina -linear elastic stress-strain characteristics of fiber-reinforced material.	CO2
	B	Plane stress relations in a global coordinate system, Transformation relations-transformed reduced compliances & stiffness	CO2
	C	Effects of free thermal strains and moisture strains	CO4
	Unit 3	**Micro mechanical analysis of laminated composite materials**	
	A	Micromechanical analysis of a lamina, Volume and mass fractions, Density, and Void content	CO3
	B	Prediction of engineering properties using micromechanics, Material properties of the fiber and matrix	CO3
	C	Experimental techniques for evaluating mechanical properties of composite materials	CO3
	Unit 4	**Classical Lamination Theory**	
	A	Kirchhoff Hypothesis, Laminate nomenclature, Laminate strains and displacements, Implications of the Kirchhoff hypothesis.	CO5
	B	Laminate stresses & strains -Stress distributions through the thickness	CO5
	C	Force and moment resultants-Laminate stiffness matrix: ABD matrix, Classification of laminates and their effect on the ABD matrix, Elastic couplings.	CO5
	Unit 5	**Theories of Failures of Laminates**	
	A	Symmetric laminates, Cross-ply laminates, Angle ply laminates, Antisymmetric laminates, Balanced laminate, Quasi-isotropic laminates.	CO4, CO6
	B	Failure theories for fiber-reinforced materials, Maximum stress criterion, Tsai-Wu criterion	CO4, CO6
	C	Environmental effects- Effect of laminate classification on the unit thermal force and moment resultants	CO4, CO6

	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	
	Text book/s*	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.			

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME121.1	1								1	1
MME121.2	2	2	1						1	1
MME121.3	2	2	1						1	1
MME121.4	2	2	1						1	1
MME121.5	2	2	1						1	1
MME121.6	2	2	1						1	1
MME121	2	2	1	-	-	-	-	-	1	1

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

School: SSET		**Batch : 2024-2026**	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: I**	
1	**Course Code**	MME119	
2	**Course Title**	Machine Tool Design	
3	**Credits**	4	
4	**Contact Hours (L-T-P)**	3-1-0	
	Course Status	Program Elective	
5	**Course Objective**	1. Provide a thorough understanding and application of the concepts of design of machine tools. 2. Gain the knowledge of critical functional and operational requirements of different types of machine tools. 3. Gain adequate understanding on tool designer's aims and objectives. 4. Develop skills for designing machine components and machine tools.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Infer basic motions involved in a machine tool. CO2: Design and Analyze systems for specified speeds and feeds. CO3: Design of machine tool structure, bed, table and ram CO4: Design of drives and power screws. CO5: Design of spindles and supports. CO6: Analysis of stress in design of various parts of machine tool	
7	**Course Description**	To impart the fundamental notions of the machine tools including the different types, construction, applications and their technological capabilities. To provide exposure to the systematic methods for solving the problems of designing machine tools and their components by exploring the various design aspects of machine tools elements like transmissions, structures, materials, kinematics, dynamics and construction of machine tools, etc.	
8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Introduction**	
	A	Parameters defining working motions of a machine tool	CO1, CO4
	B	Machine tool drives, Mechanical transmission and its elements, General requirements of machine tool design	CO1, CO4
	C	Engineering design process applied to machine tools	CO1, CO4
	Unit 2	**Regulations of Speed and Feed Rates**	
	A	Aim of speed and feed rate regulation	CO1, CO3

	B	Design of speed box, Design of feed box	CO1, CO3
	C	Classification of speed and feed boxes	CO1, CO3
	Unit 3	**Design of Machine Tool Structures**	
	A	Design criteria for machine tool structures, Materials of machine tool structures, Static and dynamic stiffness	CO2
	B	Design of beds, columns and housings	CO2
	C	Design of bases, tables and rams	CO2
	Unit 4	**Design of Guideways and Power Screws**	
	A	Functions and types of Guideways, Design criteria and calculations for slideways	CO5
	B	Design of aerostatic and anti-friction slideways	CO5
	C	Design of power screws	CO5
	Unit 5	**Design of Spindles and Spindle Bearings**	
	A	Functions of spindle unit and its requirements	CO6
	B	Design calculations of spindles	CO6
	C	Design of anti-friction and sliding bearings	CO6
	Mode of examination	Theory	
	Weightage Distribution	CA / MTE / ETE 25% / 25% / 50%	
	Text book/s*	1. Gupta, V., "Mechanics of Materials", Narosa publishing house, 1st Edition	
	Other References	1. Ryder, G.H., "Strength of Materials", Macmillan(2002),3rd Edition 2. Download MD Solids software(http://www.mdsolids.com/download.htm)	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME119.1	3	2	-	1	-	1	-	-	1	1
MME119.2	3	3	-	3	1	1	-	-	1	1
MME119.3	3	3	-	3	1	1	-	-	1	1
MME119.4	2	1	1	1	2	1	-	-	1	1
MME119.5	2	1	-	1	2	1	-	-	1	1
MME119.6	2	1	1	3	2	1	-	-	1	1
MME119	2	2	1	2	2	1	-	-	1	1

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

School: SSET		Batch : 2024-2026	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: I**	
1	**Course Code**	MME123	
2	**Course Title**	Advance Machine Design	
3	**Credits**	3	
4	**Contact Hours (L-T-P)**	3-0-0	
	Course Status	Program Elective	
5	**Course Objective**	1. To understand the fatigue of materials. 2. To understand the role of mean stress and factors influences S-N curve. 3. To understand how to estimate the life using strain life approach and properties. 4. To understand the concept of residual stresses 5. To understand types of surface failure.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: C01: Interpret the concept of modes of failure (macroscopic and microscopic features in fatigue fracture and the concept of fatigue design model & methods.) CO2: Analyse statistical nature of fatigue using S-N approach. CO3: Interpret monotonic stress-strain behaviour of material and its life estimation by ε-N approach. CO4: Estimate residual stresses and understand the concept of statistical aspects of fatigue. CO5: Analyse dynamic contact stresses and surface fatigue strength. CO6: Interpret the concept of fatigue under various load condition	
7	**Course Description**	The course focuses on applied engineering design, with a view to producing products that are safe, reliable, and economical. It offers in-depth coverage of today's most common analytical methods of fatigue design and fatigue life predictions/estimations for metals.	
8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Introduction and Fatigue of Materials**	
	A	Role of failure prevention analysis in mechanical design ,Modes of mechanical failure, Review of failure theories for ductile and brittle materials including Mohr’s theory and modified Mohr’s theory	CO1
	B	High cycle and low cycle fatigue, Fatigue design models ,Fatigue design methods ,Fatigue design criteria, Fatigue testing, Test methods and standard test specimens	CO1
	C	Fatigue fracture surfaces and macroscopic features, Fatigue mechanisms and microscopic features.	CO1

	Unit 2	**Stress-Life (S-N) Approach**			
	A	S-**N** curves, Statistical nature of fatigue test data, General S-N behaviour			CO2,CO6
	B	Mean stress effects, Different factors influencing S-N behaviour, S-N curve representation and approximations			CO2,CO6
	C	Constant life diagrams, Fatigue life estimation using S-N approach.			CO2,CO6
	Unit 3	**Strain-Life(S-N)approach**			
	A	Monotonic stress-strain behavior ,Strain controlled test methods ,Cyclic stress-strain behaviour			CO3,CO6
	B	Strain based approach to life estimation, Determination of strain life fatigue properties			CO3,CO6
	C	Mean stress effects, Effect of surface finish, Life estimation by ε-N approach			CO3,CO6
	Unit 4	**Residual Stress and Statistical Aspects of Fatigue**			
	A	Production of Residual Stresses and Fatigue Resistance, Relaxation of Residual Stresses, Measurement of Residual Stresses, Stress Intensity Factors for Residual Stresses			CO4
	B	Definitions and quantification of data scatter, Probability distributions, Tolerance limits			CO4
	C	Regression analysis of fatigue data ,Reliability analysis			CO4
	Unit 5	**Fatigue from Variable Amplitude Loading and Surface Failure**			
	A	Spectrum loads and cumulative damage, Damage quantification and the concepts of damage fraction and accumulation			CO5, CO6
	B	Cumulative damage theories, Load interaction and sequence effects, Cycle counting methods			CO5, CO6
	C	Surface geometry, Mating surface, Friction, Adhesive wear, Abrasive wear, Corrosion wear, Surface fatigue spherical contact, Cylindrical contact, General contact, Dynamic contact stresses, Surface fatigue strength.			CO5, CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	
	Text book/s*	1.**Metal Fatigue in engineering**, Ralph I. Stephens, Ali Fatemi, Robert .R. Stephens, Henry o. Fuchs, John wiley Newyork, Second edition. 2001. 2. **Failure of Materials in Mechanical Design,** Jack. A. Collins, John Wiley, Newyork 1992. 3. **Machine Design**, Robert L. Norton, Pearson.			
	Other References	1. **Fatigue of Materials,** S.Suresh, Cambridge university press, Cambridge, U.K.			

		2. **Fundamentals of Metal Fatigue Analysis,** Julie.A.Benantine Prentice Hall,1990 3. **Fatigue and Fracture,** ASM Hand Book, Vol 19,2002	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME123.1	3	2	-	1	-	1	2	3	3	1
MME123.2	3	3	-	3	1	1	2	3	3	1
MME123.3	3	3	-	3	1	1	2	3	3	1
MME123.4	2	1	1	1	2	1	2	3	3	1
MME123.5	2	1	-	1	2	1	2	3	3	1
MME123.6	2	1	1	3	2	1	2	3	3	1
MME123	2	2	1	2	2	1	2	3	3	1

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

School: SSET		Batch : 2024-2026
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: II**
1	**Course Code**	MME120
2	**Course Title**	Fracture Mechanics
3	**Credits**	4
4	**Contact Hours (L-T-P)**	4-0-0
	Course Status	Program Elective
5	**Course Objective**	• Introduce students to the concepts of materials fracture and failure analysis; and • Equip them with knowledge on how to design against catastrophic failures and skills required in carrying out failure analysis
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Apply the concepts of fracture mechanics to predict brittle fracture. CO2: Identify and describe the basic fracture and fatigue mechanisms CO3: Use the concepts of Linear Elastic Fracture Mechanics on brittle materials. CO4: Students shall be able to identify the plane stress and plane strain conditions based on the shape and size of plastic zones. CO5: Understand the relation among crack tip opening displacement, SIF and ERR and application of such parameters for ductile and brittle materials CO6: Familiarize the experimental techniques to determine the critical values of parameters at crack tip
7	**Course Description**	This course is an elective, designed for students interested in building knowledge and technical expertise in the principles governing: (1.) design of engineering materials against crack induced fracture in service applications, (2.) diagnosis of cause(s) and mechanisms of failure, and (3.) experimental techniques for characterizing fractures. The course covers the fundamental types of fracture and their characteristic features, fracture modes and theories of fracture mechanics (the efforts of Griffith, Irwin etc will be highlighted).

8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Introduction**	
	A	Fracture mechanics principles: Introduction and historical review, Sources of micro and macro cracks. Stress concentration due to elliptical hole, Strength ideal materials, Griffith's energy balance approach	CO1
	B	Fracture mechanics approach to design. NDT and Various NDT methods used in fracture mechanics, Numerical problems	CO1,CO2
	C	The Airy stress function. Complex stress function. Solution to crack problems. Effect of finite size. Special cases, Elliptical cracks, Numerical problems.	CO1,CO2
	Unit 2	**Determination of SIF and Plain Strain Fracture Toughness**	
	A	Introduction, analysis and numerical methods, experimental methods, estimation of stress intensity factors	CO2,CO3
	B	Plasicity effects, Irwin plastic zone correction. Dugdale approach. The shape of the plastic zone for plane stress and plane strain cases, Plastic constraint factor. The Thickness effect, numerical problems	CO2,CO3
	C	Plane strain fracture toughness test, The Standard test. Size requirements. Non-linearity. Applicability.	CO2,CO3
	Unit 3	**Elastic –Plastic Fracture Mechanics**	
	A	The energy release rate, Criteria for crack growth. The crack resistance (R curve). Compliance, J integral. Tearing modulus. Stability	CO4,CO5
	B	Fracture beyond general yield. The Crack-tip opening displacement. The Use of CTOD criteria.	CO4,CO5
	C	Experimental determination of CTOD. Parameters affecting the critical CTOD. Use of J integral. Limitation of J integral.	CO4,CO5
	Unit 4	**Dynamics and Crack Arrest**	
	A	Crack speed and kinetic energy. Dynamic stress intensity and elastic energy release rate.	CO5,CO6
	B	Crack branching. Principles of crack arrest. Crack arrest in practice	CO5,CO6
	C	Dynamic fracture toughness	CO5,CO6
	Unit 5	**Fatigue Crack propagation and Applications of Fracture Mechanics**	
	A	Crack growth and the stress intensity factor. Factors affecting crack propagation	CO6
	B	Variable amplitude service loading, Means to provide fail-safety, Required information for fracture mechanics approach	CO6
	C	Mixed mode (combined) loading and design criteria	CO6
	Mode of examination	Theory	

	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	
	Text book/s*	***Elementary Engineering Fracture Mechanics -*** *David Brock, Noordhoff.* ***Elements Of Fracture Mechanics*** *– Prashant Kumar.*			
	Other References	***Fracture Mechanics-Fundamental and Application -*** *Anderson, T.L CRC press1998.*			

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME120.1	3	3		1						1
MME120.2	3	3		1						1
MME120.3	3	3		1						1
MME120.4	3	3		1						1
MME120.5	3	3		1						1
MME120.6	3	3		1						1
MME120	3	3	-	1	-	-	-	-	-	1

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

School: SSET		**Batch: 2024-2026**
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Regular**
1	**Course Code**	MME124
2	**Course Title**	Design for Manufacture and Assembly
3	**Credits**	4
4	**Contact Hours (L-T-P)**	4-0-0
	Course Status	Program Elective
5	**Course Objective**	DFM involves designing for the ease of manufacture of a product's constituent parts. It is concerned with selecting the most cost-effective materials and processes to be used in production, and minimising the complexity of the manufacturing operations. DFA involves design for a product's ease of assembly. It is concerned with reducing the product assembly cost and minimising the number of assembly operations.
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1: Apply the principles of limits and tolerances in design and assembly of mechanical parts. CO2: Apply design principles while processing the products through casting processes. CO3: Demonstrate the fundamental design principles applied in the metal extrusion processes. CO4: Apply design principles while processing the products through machining processes CO5: Demonstrate the fundamental assembly principles applied in mechanical assembled systems. CO6: Apply the knowledge of design and assembly principles with case studies.
7	**Course Description**	DFM involves designing for the ease of manufacture of a product's constituent parts. It is concerned with selecting the most cost-effective materials and processes to be used in production, and minimising the complexity of the manufacturing operations. DFA involves design for a product's ease of assembly. It is concerned with reducing the product assembly cost and minimising the number of assembly operations.

8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Introduction**	
	A	Geometric tolerances and Feature tolerances Dimensioning	CO1
	B	Assembly limits- Datum features- Tolerance stacks.	CO1
	C	Selection of Materials and Manufacturing process, Design requirements	CO1
	Unit 2	**Design for Casting**	
	A	Design of castings based on parting line considerations, minimizing core requirements	CO2
	B	Metal injection moulded parts: Processes and suitable materials	CO2

	C	Design recommendations for metal injection-molded parts.	CO2, CO6
	Unit 3	**Design for Metal Extrusion**	
	A	Design recommendation for metal extrusion and stamping	CO3
	B	Design recommendation for fine blanked parts and Rolled formed section	CO3
	C	Design for Forging: Forging processes, Suitable materials and Design recommendations	CO3, CO6
	Unit 4	**Design for Machining**	
	A	Economics of machining Features to facilitate machining-surface finish.	CO4
	B	Review of relationship between attainable tolerance grades and different machining processes.	CO4
	C	Design for Turning, drilling and milling.	CO4, CO6
	Unit 5	**Design for Assembly**	
	A	Design for Assembly principles and process	CO5
	B	Design for Welding, Brazing and Soldering	CO5
	C	Design for Joining of Plastics	CO5, CO6
	Mode of examination	Theory	
	Weightage Distribution	CA: 25%, MTE: 25%, ETE: 50%	
	Text book/s*	1. Boothroyd, G., Peter Dewhurst, Winston A. Knight, Product Design for Manufacture and Assembly, Third Edition, CRC Press, Taylor &Francis 2010.	
	Other References	1. Bralla James G., Hand Book of Product Design for Manufacturing, McGraw Hill. 1986. 2. G. Boothroyd, P. Dewhurst and W. Knight, Product Design for Manufacture and Assembly, Mercel Dekker Inc. New York, 2002.	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME124.1	3	1	2	1	-	-	-	1	1	1
MME124.2	3	3	2	1	-	-	-	1	1	1
MME124.3	3	2	2	1	-	-	-	1	1	1
MME124.4	3	3	2	2	-	-	-	1	1	1
MME124.5	3	3	2	3	-	-	-	1	1	1
MME124.6	3	3	2	3	-	-	-	2	2	2
MME124	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**1**	**1**	**1**
MME124	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**1**	**1**	**1**

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

School: SSET		**Batch : 2024-2026**
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: I**
1	**Course Code**	MME010
2	**Course Title**	Advance Power Plant Engineering
3	**Credits**	3
4	**Contact Hours (L-T-P)**	3-0-0
	Course Status	Program Elective
5	**Course Objective**	To provide students an understanding of various energy resources, their economic implications, present Indian scenario, working of various conventional power plants and their analysis and nonconventional power generation.
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1. Examine the Rankine Cycle and its various modifications. CO2. Model the hydroelectric power plant CO3. Analyse Gas Turbine plant CO4. Design Nuclear Power Plant CO5. Create the thermal energy storage systems CO6. Predict the suitability of a power generation system for different locations.
7	**Course Description**	This course focuses on the different methods of power generation, their merits, demerits and limitations. It also focuses on working and analysis of various renewable energy generation systems and future trends in power generation science.

8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Introduction and Steam Power Plant**	
	A	Load curves, Terms and definitions, Performance and operating characteristics of power plants, tariff methods of electrical energy	CO1
	B	Rankine cycle, rankine cycle with reheat and regeneration, Cogeneration of power and process heat,	CO1
	C	Binary vapour cycle, coupled cycle, Combined vapour cycle	CO1
	Unit 2	**Hydroelectric Power Plant**	
	A	Introduction, Hydrological cycle, Hydrograph. Selection of site for hydroelectric power plant.	CO2, CO6
	B	Flow duration curve, storage capacity, optimization of hydro thermal mix, Layout of a hydroelectric power plant	CO2
	C	Elements of hydroelectric power plant, classification of hydroelectric power plant.	CO2
	Unit 3	**Gas turbine power plant**	

	A	Simple gas turbine, assumptions of ideal cycle analysis, site selection, open cycle and close cycle arrangements, cycle efficiency	CO3, CO6
	B	Basic requirements of the working medium, properties of various working medium, Brayton cycle, gas turbine with heat exchanger, intercooler	CO3
	C	Gas turbine with reheat and regeneration Gas Turbine fuels, gas turbine materials, Gas turbine-Steam turbine plant	CO3
	Unit 4	**Nuclear Power Plant**	
	A	Nuclear fuels, Nuclear energy, Main components of nuclear power plant layout, site selection	CO4, CO6
	B	Nuclear reactors-types	CO4
	C	Radiation shielding, Radio-active waste disposal, Safety aspects.	CO4
	Unit 5	**Thermal Energy Storage and Solar Thermal Power**	
	A	Introduction Classification and Characteristics of Storage Systems, Chemical Energy Storage, Sensible Heat Storage,	CO5
	B	Latent-Heat or Phase-Change Storage, Cool Thermal Energy Storage, principle of solar thermal power generation, Solar Tower Power Station, Parabolic trough Power Plants	CO5
	C	Dish/Stirling System, Solar Updraft Tower Power Plants, Solar Pond Power Plants	CO5
	Mode of examination	Theory	
	Weightage Distribution	CA: 25% / MTE: 25% / ETE: 50%	
	Text book(s)*	1. Nag, P.K., Power Plant Engineering, Tata Mcgraw Hill Education Private Limited,2010	
	Other References	1. Elanchezhian C., Saravanakumar L., Vijaya Ramnath B., Power Plant Engineering, I.K. International Publishing House Pvt., Limited, 2007 2. Sharma P.C., Power Plant Engineering, S. K. Kataria & Sons, 2009 Download Intergraph software from http://intergraph.com	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME010.1	2	2	-	-	-	2	2	1	1	2
MME010.2	2	2	-	-	-	-	2	1	1	2
MME010.3	3	2	2	-	-	-	2	1	1	2
MME010.4	2	1	-	-	-	-	2	2	1	2
MME010.5	2	2	2	-	-	2	2	2	2	2
MME010.6	2	1	2	-	-	-	2	`2	2	2
MME010	2	2	2	-	-	2	2	2	2	2

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

School: SSET		**Batch : 2024-2026**
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: I**
1	**Course Code**	MME 102
2	**Course Title**	Heat and Mass Transfer
3	**Credits**	4
4	**Contact Hours (L-T-P)**	3-1-0
	Course Status	Program Elective
5	**Course Objective**	1. Students will understand the basic concepts of conduction, convection and radiation heat transfer. 2. Students will understand how to formulate and be able to solve one and two dimensional conduction heat transfer problems. Solution techniques will include both closed form and numerical methods. Convection effects will be included as boundary conditions and applications of Numerical Methods 3. Students will understand the fundamentals of the relationship between fluid flow, convection heat transfer and mass transfer. 4. Students will apply empirical correlations for both forced and free convection to determine values for the convection heat transfer coefficient. They will then calculate heat transfer rates using the coefficients. 5. Students will understand the basic concepts of radiation heat transfer to include both black body radiation and gray body radiation.
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1.Formulate heat conduction equation for different modes of heat transfer CO2.Solve 2D and three-dimensional heat conduction problems CO3.Elaborate finite difference and finite volume methods. CO4.Analyze free and forced convection problems. CO5.Apply the concepts of radiation heat transfer for enclosure analysis. CO6.Create mathematical model for mass transfer.
7	**Course Description**	A student achieving a passing grade in this course will be able to do basic calculations involving heat and mass transfer as is typical for a mechanical engineer. This includes conduction, convection and radiation heat transfer as well as heat exchanger design.

8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Basic heat transfer:**	
	A	Review of basic heat transfer: Introduction to Conduction, convection and radiation heat transfer.	CO1
	B	1-D Steady State Heat Conduction: Fins with variable cross-section, generalized equation for fins, Fins of parabolic and triangular profiles, Transient in lumped systems.	CO1,CO2

	C	Multi-Dimensional Conduction: Analytical and graphical methods for solving multidimensional problems	CO2
	Unit 2	**Numerical Heat Transfer**	
	A	Finite Difference Method: Discretization, Backward, forward and Central differencing schemes, application of FDM to 1-D and 2-D heat conduction, Matrix inversion, Point by point iteration, line by line iterative method.	CO3
	B	FDM applications for convective diffusion problems, Upwind differencing scheme, artificial diffusion, application of FDM to transient heat conduction, Explicit, implicit and semi-implicit method, concepts of consistency, stability and convergence analysis.	CO3
	C	Finite Volume Method: Basic concept, flux balance, FVM for solving heat conduction problems, FVM formulation for convective diffusion, Compressible flow modeling. Introduction to commercial software such as ANSYS-Fluent.	CO3
	Unit 3	**Convective Heat Transfer:**	
	A	Momentum and Energy Integral Equation, Thermal and hydrodynamic boundary layer thickness, Heat transfer in a circular pipe in laminar flow when constant heat flux and constant wall temperature to the wall of the pipe	CO4
	B	convection correlations for turbulent flow in tubes, Flow over cylinders and spheres, Flow across tube bundles/banks	CO4
	C	,Natural convection, Heat transfer from a vertical plate using the Integral method, Free convection in enclosed spaces, Mixed convection. Introduction to Boiling and Condensation Heat Transfer	CO4
	Unit 4	**Heat Exchangers and Thermal Radiation**	
	A	Review of basic concepts, Tubular and plate type heat exchanger, Overall heat transfer coefficient, LMTD, correction factor,	CO5
	B	Effectiveness, Introduction to design of heat exchangers.	CO5
	C	Review of basics of surface radiation, non gray body, radiation shape factor, Hottel's Crossed String Method for finding shape factor, Radiosity and irradiation formulation, radiation shield and Gas radiation	CO5
	Unit 5	**Mass Transfer**	
	A	Introduction, Fick's law, General equation of mass diffusion steady state	CO6
	B	diffusion through a plain membrane, diffusion of water vapour through air, Mass transfer coefficient, convective mass transfer	CO6
	C	boundary layer governing equations, momentum heat & mass transfer analogies, mass transfer correlations	CO6
	Mode of examination	Theory	

	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	

	Text book/s*	1. Fundamentals of Engineering Heat & Mass Transfer by R. C. Sachdeva, New Age Publishers 2. Heat and Mass Transfer by Y A Cengel and A J Ghajar, Mc Graw Hill.	
	Other References	1. Heat and Mass Transfer by F P Incropera, John Wiley & Sons Pte Ltd 2. Analysis of Heat and mass Transfer by E R G Eckert and R M Drake, Mc Graw Hill Book Company.	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME102.1	3	2	1	1	-	-	-	2	2	2
MME102.2	2	2	1	2	-	-	-	1	2	2
MME102.3	2	3	3	2	-	-	-	2	2	2
MME102.4	2	3	2	1	-	-	-	2	1	2
MME102.5	2	2	1	1	-	-	-	2	2	2
MME102.6	2	2	1	1	-	-	-	1	1	1
MME102	2	2	1	1	-	-	-	2	2	2

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

Programme: M.Tech		Batch:- 2024-2026 Current Academic Year: 2024-2025	
Branch: ME		**Semester: I**	
1	**Course Code**	MME 108	
2	**Course Title**	Advanced mechanics of fluids	
3	**Credits**	3	
4	**Contact Hours (L-T-P)**	3-0-0	
	Course Status	Program Elective	
5	**Course Objective**	1. To provide students an understanding of the basic tools for the analysis and solution of different types of flows, ranging from the ideal to the viscous flow 2. To familiarize students with mathematical concepts of gradient, divergence, tensor and vorticity, 3. To teach students the basic properties normally attributed to fluids such as density, compressibility and dynamic viscosity 4. To familiarize students the governing equations of fluid motion, viscous flow, transient flow and potential flow	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1. Develop advance knowledge of the mechanics of fluids. CO2. Model the fluids motion CO3. Formulate the potential flow mathematical equation for viscous flow CO4. Predict the behaviour of potential flows CO5. Analyze the transient flow. CO6. Apply the knowledge of fluid mechanics in complex fluid flow system	
7	**Course Description**	This course is a survey of principal concepts and methods of fluid dynamics. Topics include mass conservation, momentum, and energy equations for continua; Navier-Stokes equation for viscous flows; Similarity and dimensional analysis; lubrication theory; boundary layers and separation; circulation and vorticity theorems; potential flow; introduction to turbulence; lift and drag; surface tension and surface tension driven flows.	
8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Basic Concepts and fundamental**	
	A	Definition and properties of fluids, Fluid as continuum	CO1
	B	Langrangian and Eulerian description, Velocity and stress field	CO1
	C	Fluid statics, Fluid Kinematics	CO1
	Unit 2	**Governing Equations of Fluid Motion**	
	A	Reynolds transport theorem, Integral and differential forms of governing equations	CO2
	B	mass, momentum and energy conservation equations	CO2
	C	Navier-Stokes equations, Euler's equation, Bernoulli's Equation	CO2
	Unit 3	**Viscous flow**	
	A	Exact solution; plane Poiseuille and Coutte flows; Hagan- Poiseuille flow through pipes; flows with	CO3

		very small Reynold's numbers, Creeping flows. Stokes flow around a Sphere	
	B	Flows with very large Reynold's numbers; elements of two dimensional boundary layer theory; displacement thickness and momentum thickness and energy thickness; skin friction	CO3
	C	Blausius solution for boundary layer on a flat plate with & without pressure gradient; Von-Karman integral method. Drag on bodies; form drag and skin friction drag; profile drag and its Measurement	CO3, CO6
	Unit 4	**Potential Flows**	
	A	Revision of fluid kinematics, Stream and Velocity potential function, Circulation, Irrotational vortex, Basic plane potential Flows	CO4
	B	Uniform stream; Source and Sink; Vortex flow, Doublet, Superposition of basic plane potential flows,	CO4
	C	Flow past a circular cylinder, Magnus effect; Kutta-Joukowski lift theorem; Concept of lift and drag	CO4, CO6
	Unit 5	**Transition flows**	
	A	Transition from laminar to turbulent flows, Reynold's stresses, turbulent boundary layer over a flat plate	CO5
	B	transition for flat plate flow, Intensity of turbulence. Boundary layer equations, Boundary layer thickness, Boundary layer on a flat plate, similarity solutions	CO5, CO6
	C	Integral form of boundary layer equations, Approximate Methods, Flow separation, Entry flow into a duct	CO5
	Mode of examination	Theory	
	Weightage Distribution	CA: 25%; MTE: 25%; ETE: 50%	
	Text book/s*	1. Introduction to fluid mechanics and Fluid Machines, S.K Som and G.Biswas.McGraw Hill 2. Fluid Mechanics by Y A Cengel and M Cimbala, Mc Graw Hill Education	
	Other References	1. Boundary Layer Theory by Schlichting, Mcgraw Hill 2. Fluid Mechanics and its applications, Gupta and Gupta, Willey Eastern	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME108.1	3	3	-	-	-	-	-			2
MME108.2	3	3	-	-	-	-	-			2
MME108.3	3	2	1	-	-	-	-			2
MME108.4	3	3	1	-	-	-	-			2
MME108.5	3	3	1	-	-	-	-			2
MME108.6	3	2	1							2
MME 108	3	3	1	-	-	-	-	-	-	2

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

<table>
<tr><td colspan="2">School: SSET</td><td colspan="2">Batch : 2024-2026</td></tr>
<tr><td colspan="2">Programme: M.Tech</td><td colspan="2">Current Academic 2024-2025</td></tr>
<tr><td colspan="2">Branch: ME</td><td colspan="2">Semester: II</td></tr>
<tr><td>1</td><td>Course Code</td><td colspan="2">MME125</td></tr>
<tr><td>2</td><td>Course Title</td><td colspan="2">Gas Turbine and Compressor</td></tr>
<tr><td>3</td><td>Credits</td><td colspan="2">4</td></tr>
<tr><td>4</td><td>Contact Hours (L-T-P)</td><td colspan="2">4-0-0</td></tr>
<tr><td></td><td>Course Status</td><td colspan="2">Program Elective</td></tr>
<tr><td>5</td><td>Course Objective</td><td colspan="2">1. Familiarity with common types of gas turbines and compressors
2. To develop knowledge of thermodynamic cycles of turbine and compressors
3. To develop Working knowledge of the basic operations, design requirements and, performance analysis of gas turbines and compressors</td></tr>
<tr><td>6</td><td>Course Outcomes</td><td colspan="2">After the successful completion of course, students will be able to:
CO1. Explain the working principle of gas turbine and classify various gas turbine cycles.
CO2. Analyse gas turbine cycle with heat exchanger, intercooler, reheat and regeneration.
CO3. Design the gas turbine.
CO4. Recommed the centrifugal compressor
CO5. Predict the performance of axial flow compressor
CO6. Improve the performance parameters of gas turbine and compressors</td></tr>
<tr><td>7</td><td>Course Description</td><td colspan="2">This subject deals with the working and thermodynamics of gas turbine and compressors. This course covers ideal and actual cycle analysis of gas turbine, analysis of centrifugal and axial flow compressors.</td></tr>
<tr><td>8</td><td colspan="2">Outline syllabus</td><td>CO Mapping</td></tr>
<tr><td></td><td>Unit 1</td><td>Introduction</td><td></td></tr>
<tr><td></td><td>A</td><td>Simple gas turbine, assumptions of ideal cycle analysis, open cycle and close cycle arrangements, cycle efficiency</td><td>CO1</td></tr>
<tr><td></td><td>B</td><td>Basic requirements of the working medium, properties of various working medium,</td><td>CO1</td></tr>
<tr><td></td><td>C</td><td>its applications , Comparison of gas turbine with reciprocating engine</td><td>CO1</td></tr>
<tr><td></td><td>Unit 2</td><td>Gas Turbine: Ideal cycle and Their Analysis</td><td></td></tr>
<tr><td></td><td>A</td><td>Heat exchange cycle, reheat cycle, reheat and heat exchange cycle</td><td>CO2</td></tr>
<tr><td></td><td>B</td><td>Intercooled cycle, intercooled cycle with heat exchanger , intercooled with reheat cycle</td><td>CO2</td></tr>
</table>

	C	Intercooled cycle with reheat and heat exchanger, regenerative cycle	CO2, CO6
	Unit 3	**Gas Turbine: Practical Cycle and Their Analysis**	
	A	Assumptions, compressor and turbine efficiency, pressure and flow loses	CO3
	B	Heat Exchanger Effectiveness, polytropic efficiency	CO3
	C	Effect of variable specific heat, mechanical losses, loss due to incomplete combustion, performance of actual cycle	CO3
	Unit 4	**Centrifugal Compressors**	
	A	Essential parts of centrifugal compressor, principle of operation, ideal energy transfer,	CO4
	B	Blades shape and velocity profile, analysis of flow through compressor, Losses in centrifugal compressor	CO4
	C	Volute casting, performance parameters, compressor characteristics, Surging and choking	CO4, CO6
	Unit 5	**Axial Flow Compressor**	
	A	Geometry and working principle, stage velocity triangle, work done factor	CO5
	B	h-s diagram, compressor stage efficiency, performance coefficient, degree of reaction	CO5, CO6
	C	Flow through blade rows, flow losses, stage losses, performance characteristics, comparison between axial and centrifugal compressor	CO5, CO6
	Mode of examination	Theory	
	Weightage Distribution	CA: 25 % / MTE: 25% / ETE: 50%	
	Text book/s*	1. Ganesan, V., Gas Turbines, Tata McGraw-Hill	
	Other References	1. Cohen, H., Rogers, G.E.C., and Saravanamuttoo, H.I.H., Gas Turbine Theory, Longman Yahya, S.H. Turbines, Compressors and Fans, Tata McGraw-Hill	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME125.1	3	1	-	-	-	-	1	1	-	1
MME125.2	2	2	2	-	-	-	1	2	1	1
MME125.3	2	2	2	-	-	-	1	2	1	1
MME125.4	2	2	2	-	-	-	1	1	1	1
MME125.5	2	2	2	-	-	-	1	1	1	1
MME125.6	2	2	2	-	-	-	1	1	1	1
MME125	2	2	2	-	-	-	1	1	1	1

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

School: SSET		Batch : 2024-2026	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: 02**	
1	**Course Code**	MME126	
2	**Course Title**	Advance Thermodynamics	
3	**Credits**	4	
4	**Contact Hours (L-T-P)**	3-0-1	
	Course Status	Program Elective	
5	**Course Objective**	This course introduces advance concepts in thermodynamics. It is an extension to the introductory theory of energy analysis with strong emphasis on the concepts of enthalpy, exergy, reactive system and vapour power cycle.	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1.Develop the concepts of basic thermodynamics. CO2.Apply the basic knowledge to model the thermodynamic relations CO3.Analyse the efficiency, entropy and exergy of thermodynamic systems. CO4.Simplify the equations of reactive system and analyze second law of thermodynamics CO5.Design thermodynamic system for industry CO6.Create the vapour and combined power system	
7	**Course Description**	Advance Thermodynamics provides knowledge about thermodynamics laws, relations, compressibility, exergy transfer, first & second law analysis of reactive systems and statistical thermodynamics. It also provides knowledge about vapour power cycles and cogeneration.	
8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Introduction**	
	A	Introduction of thermodynamics, Review of basic definitions, Thermodynamic properties and their units,	CO1
	B	Laws of thermodynamics, thermodynamic relations: Maxwell relations, Clapeyron equation, Joule-Thompson coefficient and Inversion curve,	CO2
	C	Coefficient of volume expansion, Adiabatic & Isothermal compressibility.	CO2

	Unit 2	**Entropy &Exergy**			
	A	Entropy as a property, Clausius inequality, principle of increase of entropy, change of entropy for an ideal gas and pure substance			CO3
	B	work potential of energy, reversible work and irreversibility, second law efficiency			CO3
	C	exergy transfer by work, heat and mass			CO3
	Unit 3	**Reactive System**			
	A	Combustion, enthalpy of formation and enthalpy of combustion, enthalpy and internal energy of system,			CO4
	B	first Law analysis of reacting systems, Adiabatic Flame temperature, absolute entropy and third law of thermodynamics,			CO4
	C	Second Law analysis of reacting systems, second law efficiency of reactive system.			CO4
	Unit 4	**Gas Mixtures& Statistical Thermodynamics**			
	A	Composition of gas mixture: mass and mole, p-v-T behavior of gas mixtures: ideal & real gases, properties of gas mixtures: ideal & real gases.			CO5
	B	Quantum hypothesis, quantum system applied to system of particles,			CO5
	C	wave particle duality, microstate and macro state.			CO5
	Unit 5	**Vapour and combine power cycle**			
	A	Carnot vapour cycle, Rankine cycle: the ideal cycle for vapour power cycles			CO6
	B	deviation of actual vapour power cycle from idealized one, ideal reheat rankine cycle, ideal regenerative rankine cycle,			CO6
	C	cogeneration, combine cycle: mercury water binary vapour cycle.			CO6
	Mode of examination	Theory			
	Weightage Distribution	CA	MTE	ETE	
		25%	25%	50%	
	Text book(s)*	1. Thermodynamics an engineering approach by Yunus A. Cengel& Michael A. Boels, Tata MacGraw Hill.			
	Other References	1. Basic & applied thermodynamics by P.K Nag, Tata MacGraw Hill. 2. Fundaments of engineering thermodynamics by Michael J. Moran & Howard N. Shapiro, John Wily & sons.			

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME126.1	2	2	-	-	-	2	3	1	1	-
MME126.2	2	2	-	-	-	-	3	2	2	1
MME126.3	3	2	2	-	-	-	3	2	3	1
MME126.4	2	1	-	-	-	-	3	1	1	-
MME126.5	2	2	1	-	-	2	3	1	1	-
MME126.6	2	1	-	-	-	-	3	`1	1	-
MME126	2	2	1	-	-	2	3	1	2	1

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

School: SSET		**Batch : 2024-2026**	
Programme: M.Tech		**Current Academic Year: 2024-2025**	
Branch: ME		**Semester: II**	
1	**Course Code**	MME 115	
2	**Course Title**	Refrigeration , Air Conditioning & Cryogenic System	
3	**Credits**	4	
4	**Contact Hours (L-T-P)**	4-0-0	
	Course Status	Program Elective	
5	**Course Objective**	1. To teach students the principles of refrigeration and air conditioning. 2. To teach students how to calculate the cooling load for different applications. 3. To develop knowledge of different Refrigerants 4. To teach students different refrigeration & air conditioning equipment	
6	**Course Outcomes**	After the successful completion of course, students will be able to: CO1.Classify different refrigeration system CO2.Analyze the vapour absorption Refrigeration system CO3.Appraise the low temperature Refrigeration System. CO4.Estimate the Human comfort requirements in air conditioning system. CO5.Modify the refrigeration & air conditioning equipment's CO6.Evaluate the COP of refrigeration and air conditioning systems	
7	**Course Description**	This course introduces the techniques and aspects of refrigeration and air conditioning as well the new alternative HFC s / HCs refrigerants, the cooling and heating load calculations for different applications and also the designing of refrigeration and air conditioning system for a particular application.	
8	**Outline syllabus**		**CO Mapping**
	Unit 1	**Vapour Compression**	
	A	Evolving Vapour Compression Cycle from Basic Carnot Cycle Analysis,	CO1
	B	Multistage Vapour Compression Systems,	CO1, CO6
	C	Classification of Refrigerants, Refrigerant Properties, Eco Friendly Refrigerants	CO1
	Unit 2	**Absorption System and Steam Jet Refrigeration**	
	A	Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems	CO2
	B	Aqua Ammonia & LiBr Systems,	CO2, CO6
	C	Steam Jet Refrigeration,	CO2, CO6

	Unit 3	**Low temperature Refrigeration (Cryogenics)**	
	A	Introduction, Limitations of vapor compression refrigeration system for production of low temperature	CO3
	B	Cascade refrigeration system, solid carbon dioxide or dry ice	CO3, CO6
	C	liquefaction of gases, Linde system for liquefaction of air, Clande system for liquefaction of air, Liquefaction of hydrogen	CO3, CO6
	Unit 4	**Air Conditioning**	
	A	Psychometric processes using chart. Solar heat gain, study of various sources of the internal and external heat gains, heat losses, etc.	CO4
	B	Internal heat gain , Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), ESHF, Apparatus dew point (ADP), Thermal analysis of human body	CO4
	C	Inside and outside design conditions. Requirement of ventilation air, various sources of infiltration air.	CO4
	Unit 5	**System Components and Accessories**	
	A	Types of Evaporators, Compressors, Condensers, Expansion Devices.	CO5
	B	Fundamentals of air flow in ducts, Pressure drop calculations, Design ducts by velocity reduction method, Equal friction method and static regain method, Duct materials and properties	CO5
	C	Types of fans and performance curve.	CO5
	Mode of examination	Theory	
	Weightage Distribution	CA: 25%, MTE: 25%, ETE: 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.	

Programme Outcome Vs Courses Mapping Table:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO115.1	3	3	-	-	-	-				2
CO115.2	3	3	-	-	-	-				2
CO115.3	3	2	1	-	-	-				2
CO115.4	3	3	1	-	-	-				2
CO115.5	3	3	1	-	-	-				2
CO115.6	3	3	1	-	-	-				2
MME 115	3	3	1	-	-	-	-	-	-	2

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

School: SSET		**Batch : 2024-2026**
Programme: M.Tech		**Current Academic Year: 2024-2025**
Branch: ME		**Semester: II**
	Course Code	MME128
	Course Title	Solar Energy Technology
	Credits	3
	Contact Hours (L-T-P)	3-0-0
	Course Status	Program Elective
	Course Objective	This course enables the students 1. To Critically examine the technology of Solar energy systems that will be acceptable in a world faced with global warming, local pollution, and declining supplies of oil. 2.To Analyse both the devices and the overall systems 3. To facilitate the students a clear conceptual understanding of technical andcommercial aspects of Solar Power Development and Management. 4.To enable the students to develop managerial skills to assess feasibility of alternative approaches and derive strategies regarding Solar Power Development and Management
	Course Outcomes	After the successful completion of course, students will be able to: CO1.Appraise the global scenario of solar energy CO2.Design the layout of a solar thermal power plant and predict its performance CO3. Evaluate the solar thermal conversion systems for high temperature applications. CO4. Create the Photovoltaic Energy Conversion Systems for real life applications. CO5. Select the suitable power plant on financial consideration. CO6. Comply the national and international policy for a solar power system.

	Outline syllabus		**CO Mapping**
	Unit 1	**Introduction**	
	A	Global trend in solar energy; Relevance of solar thermal power generation	CO1
	B	Solar energy – source of energy, , quantum of energy	CO1
	C	Irradiance; Type of radiation – beam, diffuse, Total;	CO1
	Unit 2	**Solar thermal power plant**	
	A	Solar thermal system – solar thermal power plant (parabolic and solar tower);	CO2
	B	Solar thermal power plant layout and working principle; Components of solar thermal power plant	CO2

	C	Design and performance, characteristics of different solar concentrator types suitable for thermal power generation.		CO2
	Unit 3	**Solar thermal conversion system for high temperature applications**		
	A	Types of solar thermal conversion system used in high temperature application, Tracking of solar concentrators		CO3
	B	performance characterization of solar concentrators both line focus and point focus, Comparative analysis of the both mode focus system		CO3
	C	Optical design and concentration characteristics of line and point focus based system		CO3
	Unit 4	**Solar Technology**		
	A	Solar technology – solar PV, solar thermal		CO4
	B	Solar resource availability in India – opportunities and challenges		CO4
	C	Solar PV power systems – roof top system, Global solar PV power trend		CO4
	Unit 5	**Solar power economics**		
	A	Solar thermal power economics; Global solar thermal power trend, Solar PV power economics		CO5
	B	Comparison between solar PV power projects and solar thermal power projects		CO5
	C	Issues of intermittency, storage and grid integration; solar power policies – World and India (RPO, REC); Solar Parks		CO6
	Mode of examination	Theory		
	Weightage Distribution	CA	MTE	ETE
		25%	25%	50%
	Text book/s*	1. Winter C.J., Sizmann R.L., Vant-Hull L.L. (1991). Solar Power Plants: Fundamentals,Technology, Systems, Economics. Springer. ISBN: 3540188975. 2. Jordan P.G. (2013). Solar Energy Markets: An Analysis of the Global Solar Industry.Academic Press. ISBN: 0123977681.		
	Other References	1. Islam M.R., Rahman F., Xu W. (2016). Advances in Solar Photovoltaic Power Plants. Springer. ISBN: 3662505193 2. Sukhatme S.P. (2008). Solar Energy: Principles of Thermal Collection and Storage. Tata McGraw-Hill Education. ISBN: 0070260648.		

Programme Outcome Vs Courses Mapping Table

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
MME128.1	2	2	2	-	-	-	-	-	-	2
MME128.2	2	2	3	-	-	-	-	-	-	3
MME128.3	3	2	2	-	-	-	-	-	-	2
MME128.4	3	2	3	-	-	-	-	-	-	3
MME128.5	2	3	2	-	-	-	-	-	-	2
MME128.6	2	2	2	-	-	-	-	-	-	3
MME128	2	2	2	-	-	-	-	-	-	2

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