R-16

CURRICULUM ESSENTIALS

Handbook on Outcome Based Education

MECHANICAL ENGINEERING

NARULA INSTITUTE OF TECHNOLOGY

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Institute Vision

To make the Institute excellent in technological education and research by imparting equitable, inclusive, ethical, flexible and multidisciplinary knowledge to budding technologists to serve the society.

Institute Mission

- To establish continuously improving academic ambience in the Institute in order to prepare the students with beyond curriculum knowledge, creativity, innovation, problem solving abilities, teamwork, communication skills etc. for their holistic development.
- To collaborate with Institutes of higher education, Professional Societies, R&D and Industrial organisations for continuous improvement of academic, research environment in the Institute and to build a strong Industry-Institute interface.
- To promote and nurture entrepreneurial and innovative quality of the students providing proper education, training and supportive facilities so that future entrepreneurs emerge with flying colors.
- To strengthen quality and knowledge-base of faculty through faculty development programmes for continuous upgradation to remain in tune with dynamically changing technology.
- To become a responsible contributor in the socio-economic development of the society through excellence in education and research.

Institute Quality Policy

- Adoption of appropriate standards and practices for good governance, to bring in transparency of all operations and thereby improve credibility at all levels.
- Industry-ready professionals to be developed through interactive teaching learning process involving state of the art class rooms, laboratories, libraries, corporate exposure and innovative project work.
- Higher studies/research for faculty & staff to be encouraged for up gradation of knowledge through participation in Quality Improvement Programs, Seminars, Workshops, Webinars etc.
- Laboratory facilities would be upgraded in emerging areas to promote R&D activities including participation in Govt. and Industry funded projects.
- Industrial consultancy to be carried out in an effective manner for developing a sense of accomplishment.
- Interaction with Professional Societies would be encouraged for the professional growth and development of the students, faculties and staff for mutual benefit.
- NBA Accreditation for all AICTE approved programs to be obtained at the earliest and maintained on a long-term basis.
- The innovative and entrepreneurial skills of the students to be nurtured through Innovation & Incubation center, finally culminating in start-ups.

Department Vision

B.Tech in Mechanical Engineering

The Mechanical Engineering Department will mould their students into technically sound as well as ethically perfect professionals with innovative leadership qualities and a confident attitude for serving the society with global attention.

Department Mission

B.Tech in Mechanical Engineering

M1: To impart a thorough knowledge of various core engineering subjects to our entire undergraduate students for ascertaining their fundamental strength in mechanical engineering.

M2: To expose our students to a curriculum consisting of modern laboratories, interdisciplinary subjects and industrial trainings in such a way that they get international exposure in world class industries.

M3: To train our students with modern drafting & analysis software for developing their computational capabilities as well as promoting higher studies and research works.

M4: To strengthen our students with innovative ideas and build the potential of leadership & teamwork through various projects in their curriculum.

M5: To build strong ethical qualities in the students for lifelong learning and serving the society and nation as a whole.

Program Educational Objects (PEOs)

B.Tech in Mechanical Engineering

PEO 1: Graduates will serve as mechanical engineer in various fields towards designing of systems, operation and production.

PEO 2: Graduates will strengthen professional practice by solving different industrial problems employing proper techniques & tools with social responsibility to reach global standards.

PEO 3: Graduates will pursue higher study, research and lifelong learning.

Program outcomes (POs)

Engineering Graduate will able to:

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

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

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

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

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

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

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

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

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

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

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

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

Program Specific Outcomes (PSOs)

B.Tech in Mechanical Engineering

PSO1: Ability to apply necessary advanced software tools for design, analysis and fabrication of components used in the field of mechanical engineering.

PSO2: Develop knowledge about engines, machineries and critical skills to analyze the cause and effect of complicated mechanical processes.

PSO3: Identify and select appropriate manufacturing processes, and apply quality control methods for production of various components and systems.

Curriculum Structure

Department of Mechanical Engineering

B. Tech First Semester Curriculum

Course Type	Course Code	Course Title	Total number of Contact Hours / Week				Credit Points
THEORY			**L**	**T**	**P**	**Total**	
BS	M 101	MATHEMATICS -I	3	1	0	4	4
BS	PH 101	PHYSICS - I	3	1	0	4	4
ES	EC 101	BASIC ELECTRONICS ENGINEERING	3	1	0	4	4
HU	HU 101	PROFESSIONAL COMMUNICATION	2	0	0	2	2
ES	ME 101	ENGINEERING MECHANICS	3	1	0	4	4
Total of Theory			**14**	**4**	**0**	**18**	**18**
PRACTICAL							
HU	HU191	LANG. LAB. AND SEMINAR PRESENTATION	0	0	2	2	1
BS	PH191	PHYSICS -I LAB	0	0	3	3	2
ES	EC 191	BASIC ELECTRONICS ENGINEERING LAB	0	0	3	3	2
ES	ME 191	WORKSHOP PRACTICE	0	0	3	3	2
Total of Practical			**0**	**0**	**11**	**11**	**07**
SESSIONAL							
XC	XC181	EXTRA CURRICULAR ACTIVITY (NSS/ NCC)	0	0	2	2	1
Total of Semester			**14**	**4**	**13**	**31**	**26**

B. Tech Second Semester Curriculum

Course Type	Course Code	Course Title	Contact Hours /Week				Credit Points
THEORY:			**L**	**T**	**P**	**Total**	
BS	M 201	MATHEMATICS -II	3	1	0	4	4
BS	CH 201	CHEMISTRY	3	1	0	4	4
ES	EE 201	BASIC ELECTRICAL ENGINEERING	3	1	0	4	4
ES	CS 201	COMPUTER FUNDAMENTALS & PRINCIPLE OF COMPUTER PROGRAMMING	3	1	0	4	4
ES	ME 201	ENGINEERING THERMODYNAMICS & FLUID MECHANICS	3	1	0	4	4
		Total of Theory	**15**	**5**	**0**	**20**	**20**
PRACTICAL:							
ES	CS291	COMPUTER FUNDAMENTALS & PRINCIPLE OF COMPUTER PROGRAMMING LAB	0	0	3	3	2
BS	CH 291	CHEMISTRY LAB	0	0	3	3	2
ES	EE 291	BASIC ELECTRICAL ENGINEERING LAB	0	0	3	3	2
ES	ME 291	ENGG DRAWING & GRAPHICS	0	0	3	3	2
		Total of Practical	**0**	**0**	**12**	**12**	**08**
SESSIONAL:							
MC	MC 281	SOFT SKILL DEVELOPMENT	0	0	2	2	0
		Total of Semester	**0**	**0**	**14**	**34**	**28**

B. Tech Third Semester Curriculum

Course Type	Course Code	Course Title	Contact hours/Week				Total Credits
			L	T	P	Total	
THEORY:							
PC	ME 301	APPLIED THERMODYNAMICS	3	0	0	3	3
PC	ME 302	STRENGTH OF MATERIALS	3	0	0	3	3
PC	ME 303	FLUID MECHANICS	3	0	0	3	3
ES	EE(ME) 301	ELECTRICAL MACHINES	3	0	0	3	3
BS	M(ME) 301	MATHEMATICS- III	3	0	0	3	3
BS	PH(ME) 301	PHYSICS- II	3	0	0	3	3
Total of Theory			**18**	**0**	**0**	**18**	**18**
PRACTICAL:							
PC	ME 391	STRENGTH OF MATERIALS LAB	0	0	3	3	2
PC	ME 392	MACHINE DRAWING- I	0	0	3	3	2
ES	EE(ME) 391	ELECTRICAL MACHINES LAB	0	0	2	2	1
BS	PH(ME) 391	PHYSICS-II LAB	0	0	3	3	2
Total of Practical			**0**	**0**	**11**	**11**	**7**
SESSIONAL							
MC	MC 381	TECHNICAL SKILL DEVELOPMENT	0	0	2	2 Units	0
Total of Semester			**18**	**0**	**13**	**31**	**25**

B. Tech Fourth Semester Curriculum

Course Type	Course Code	Course Title	Total Contact Hours/Week				Total Credits
			L	T	P	Total	
THEORY:							
PC	ME401	FLUID MACHINERY	3	0	0	3	3
PC	ME402	PRIMARY MANUFACTURING PROCESS	3	0	0	3	3
PC	ME403	ENGINEERING MATERIALS	3	0	0	3	3
PC	ME404	MECHANISMS	3	0	0	3	3
BS	M(ME)401	NUMERICAL METHODS	3	0	0	3	3
HU	HU401	ENVIRONMENTAL SCIENCE	2	0	0	2	2
Total of Theory			**17**	**0**	**0**	**17**	**17**
PRACTICAL:							
PC	ME491	FLUID MECHANICS & HYDRAULIC MACHINES LAB	0	0	3	3	2
PC	ME492	MANUFACTURING TECHNOLOGY LAB	0	0	3	3	2
PC	ME493	MATERIAL TESTING LAB	0	0	3	3	2
PC	ME494	MACHINE DRAWING-II	0	0	3	3	2
BS	M(ME)491	NUMERICAL METHODS LAB	0	0	3	3	2
Total of Practical			**0**	**0**	**15**	**15**	**10**
SESSIONAL							
HU	HU481	TECHNICAL REPORT WRITING & LANGUAGE PRACTICE	0	0	2	2	1
Total of Semester			**17**		**17**	**34**	**28**

B. Tech Fifth Semester Curriculum

Course Type	Course Code	Course Title	Total Contact Hours/Week				Total Credits
			L	T	P	Total	
THEORY:							
PC	ME501	HEAT TRANSFER	3	0	0	3	3
PC	ME502	DESIGN OF MACHINE ELEMENTS-I	3	0	0	3	3
PC	ME503	DYNAMICS OF MACHINES	3	0	0	3	3
PC	ME504	METROLOGY & MEASUREMENT	3	0	0	3	3
HU	HU(ME) 501	VALUES & ETHICS	2	0	0	2	2
PE-1	ME505A	REFRIGERATION & AIR CONDITIONING	3	0	0	3	3
	ME505B	MECHATRONICS					
	ME505C	APPLIED FLUID MECHANICS					
Total of Theory			**17**	**0**	**0**	**17**	**17**
PRACTICAL:							
PC	ME591	HEAT TRANSFER LAB	0	0	3	3	2
PC	ME592	DYNAMICS OF MACHINES LAB	0	0	3	3	2
PC	ME593	METROLOGY & MEASUREMENT LAB	0	0	2	2	1
PE LAB-I	ME594A	REFRIGERATION & AIR CONDITIONING LAB	0	0	3	3	2
	ME594B	MECHATRONICS LAB					
	ME594C	APPLIED FLUID MECHANICS LAB					
Total of Practical			**0**	**0**	**11**	**11**	7
SESSIONAL							
PROJECT	ME581	MINI PROJECT-I	0	0	3	3	2
MC	MC582	SEMINAR	0	0	2	2	0
Total of Semester			**17**	**0**	**16**	**33**	**26**

B. Tech Sixth Semester Curriculum

Course Type	Course Code	Course Title	Total Contact Hours/Week				Total Credits
			L	T	P	Total	
THEORY:							
PC	ME 601	MACHINING PRINCIPLES & MACHINE TOOLS	3	0	0	3	3
PC	ME 602	DESIGN OF MACHINE ELEMENTS-II	3	0	0	3	3
PC	ME 603	IC ENGINE & GAS TURBINE	3	0	0	3	3
PE-II	ME 604A	ROBOTICS: MECHANICS AND CONTROL	3	0	0	3	3
	ME 604B	COMPOSITE MATERIALS					
	ME 604C	FLUID POWER CONTROL					
OE-I	ME605A	RENEWABLE ENERGY SYSTEMS	3	0	0	3	3
	ME 605B	COMPUTATIONAL FLUID DYNAMICS					
	ME 605C	GAS DYNAMICS AND JET PROPULSION					
Total of Theory			**15**	**0**	**0**	**15**	**15**
PRACTICAL:							
PC	ME 691	MACHINING & MACHINE TOOLS LAB	0	0	3	3	2
PC	ME 692	DESIGN PRACTICE LAB	0	0	2	2	1
PC	ME 693	I C ENGINE LAB	0	0	3	3	2
PE LAB-II	ME 694A	ROBOTICS LAB	0	0	3	3	2
	ME 694 B	COMPOSITE MATERIALS LAB					
	ME 694 C	FLUID POWER CONTROL LAB					
Total of Practical			**0**	**0**	**11**	**11**	**7**
SESSIONAL							
PROJECT	ME 681	MINI PROJECT-II	0	0	3	3	2
MC	MC 682	GROUP DISCUSSION	0	0	2	2	0
Total of Semester			**15**	**0**	**16**	**31**	**24**

B. Tech Seventh Semester Curriculum

Course Type	Course Code	Course Title	Total Contact Hours/Week				Total Credits
			L	T	P	Total	
THEORY:							
PC	ME 701	POWER PLANT ENGINEERING	3	0	0	3	3
PC	ME 702	ADVANCED MANUFACTURING TECHNOLOGY	3	0	0	3	3
PE-III	ME 703 A	ADVANCED WELDING TECHNOLOGY	3	0	0	3	3
	ME 703 B	BIOMECHANICS & BIOMATERIALS					
	ME 703 C	FINITE ELEMENT METHOD					
PE-IV	ME 704 A	TRIBOLOGY	3	0	0	3	3
	ME 704 B	OPERATIONS RESEARCH					
	ME 704 C	MATERIALS HANDLING					
OE-II	ME 705 A	ENERGY CONSERVATION & MANAGEMENT	3	0	0	3	3
	ME 705 B	QUALITY & RELIABILITY ENGINEERING					
	ME 705 C	HYDRO, WIND AND WAVE POWER					
Total of Theory			**15**	**0**	**0**	**15**	**15**
PRACTICAL:							
PC	ME 791	ADVANCED MANUFACTURING LAB	0	0	2	2	1
PE-III lab	ME 793 A	ADVANCED WELDING LAB	0	0	2	2	1
	ME 793 B	BIOMECHANICS & BIOMATERIALS LAB					
	ME 793 C	FINITE ELEMENT METHOD LAB					
Total of Practical			**0**	**0**	**4**	**4**	**2**
SESSIONAL							
PW	ME 781	PROJECT- I	0	0	6	6	3
PW	ME 782	DESIGN OF MECHANICAL SYSTEM	0	0	3	3	2
PW	ME 783	VIVA-VOCE ON VACATIONAL TRAINING	0	0	0	0	2
Total of Semester			**15**	**0**	**13**	**28**	**24**

B. Tech Eighth Semester Curriculum

Course Type	Course Code	Course Title	Total Contact Hours/Week				Total Credits
			L	T	P	Total	
THEORY:							
HU	HU 804	PRINCIPLES OF MANAGEMENT	2	0	0	2	2
PE-V	ME 802A	AUTOMOBILE ENGINEERING	3	0	0	3	3
	ME 802B	CAD/CAM					
	ME 802C	AUTOMATION & CONTROL					
OE-III	ME 803A	TURBO MACHINERY	2	0	0	2	2
	ME 803B	MAINTENANCE ENGINEERING					
	ME 803C	NUMERICAL HEAT TRANSFER					
OE-IV	ME 804A	SAFETY & OCCUPATIONAL HEALTH	2	0	0	2	2
	ME 804B	NUCLEAR POWER GENERATION AND SUPPLY					
	ME 804C	FRACTURE MECHANICS					
Total of Theory			**9**	**0**	**0**	**9**	**9**
SESSIONAL							
PW	ME 881	PROJECT II	0	0	12	12	6
PW	ME 882	GRAND VIVA	0	0	0	0	2
Total of Semester			**9**	**0**	**12**	**21**	**17**

First Semester Theory

Course Name: Mathematics –I

Course Code: M101

Course Outcomes:

After completion of the course students would be able to,

CO1 Understand and recall the properties and formula related to matrix algebra, differential calculus, integral calculus and vector algebra.
multivariable calculus, vector calculus and infinite series

CO2 Determine the solutions of the problems related to matrix algebra, differential calculus, multivariable calculus, vector calculus and infinite series.

CO3 Apply the appropriate mathematical tools of matrix algebra, differential calculus, Integral Calculus, multivariable calculus, vector calculus and infinite series for the solutions of the related problems.

CO4 Analyze different engineering problems linked with matrix algebra, differential calculus, Integral Calculus, multivariable calculus, vector calculus,

CO5 Apply different engineering problems linked with matrix algebra, differential calculus, Integral Calculus, multivariable calculus, vector calculus.

CO-PO/PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO1**	**PSO2**	**PSO3**
M 101. CO 1	3	3	2	-								2	2	2	2
M 101. CO 2	3	3	3	3								2	2	2	2
M 101. CO 3	3	3	3	3								2	2	2	2
M 101. CO 4	3	3	3	3								2	2	2	2
M 101. CO 5	3	3	3	3								2	2	2	2

Course Name: Physics -I

Course Code: PH 101

Course Outcomes (COs):

After completion of the course students would be able to

CO1 Demonstrate experiments allied to their theoretical concepts

CO2 Conduct experiments using LASER, Optical fiber, Torsional pendulum, Spectrometer

CO3 Analyze and participate as an individual and as a member or leader in groups in laboratory sessions actively.

CO4 Analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiments.

CO5 Develop critical thinking skills to solve real life challenges.

CO-PO/PSO mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
PH 101. 1	2	3	2	3	3									2	2
PH 101. 2	2	3	2	3	3									2	2
PH 101. 3	2	3	2	3	3									2	2
PH 101. 4	2	3	2	3	3									2	2
PH 101. 5	2	3	2	3	2									2	2

Course Name: Engineering Mechanics
Course Code: ME101

Course Outcome:

Upon successful completion of the course, student should be able to:

1. Construct and understand a free body diagram.
2. Understand and calculate the reactions necessary to ensure static equilibrium.
3. Apply the effect of friction in static and dynamic conditions.
4. Analyse the different surface properties, property of masses and material properties.
5. Evaluate and solve different problems of kinematics and kinetics.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO3
ME101 .1	3	2	2	2											
ME101 .2	3	3	2	3											
ME101 .3	3	3	3	3									2	2	
ME101 .4	3	3	3	3									2	2	
ME101 .5	3	3	3	3									2	2	-

Course Name: Basic Electronics Engineering

Course code: EC101

Course Outcomes: At the end of the course students' should be able to

CO.EC101.1	Demonstrate and understand the concept of Conductors, Insulators, and Semiconductors based on energy-band theory and analyze relevant problems
CO.EC101.2	Apply the working principles of P-N Junction Diode, zener diode and analyze their applications in the rectifier, clipper, clamper, regulator etc.
CO.EC101.3	Analyze characteristics of Bipolar junction transistor(BJT) under CE, CE, CC mode of operation and its biasing therein
CO.EC101.4	Evaluate the operations of JFET, MOSFET and demonstrate their operations under CG, CS, CD configurations

CO-PO/PSO mapping:

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	-	-	-	-	-	2	-	-	2
CO2	3	3	2	-	-	-	-	-	2	-	-	2
CO3	3	3	2	-	-	-	-	-	2	-	-	2
CO4	3	3	3	-	-	-	-	-	2	-	-	2
CO5	3	2	3	-	-	-	-	-	2	-	-	2
EC 101	3	3	2	-	-	-	-	-	2	-	-	2

Course Name: Professional Communication

Course Code: HU101

Course Outcomes (COs):

After completion of the course students would be able to

CO1 Understand and communicate in English through exposure to communication skills theory and practice.

CO2 Understand and apply the basic grammatical skills of the English language and develop reading and comprehension skills.

CO3 Understand and know about and apply the basic formats, templates of business and official communication.

CO4 Understand and know about and employ formal communication modes in meetings and reports.

CO5 Understand and know about and use objective and culturally neutral language in interpersonal and business communication.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1							2		3	3		3			
CO2							2		3	3		3	2	2	2
CO3							2		3	3		3			
CO4							2		3	3		3			
CO5							2		3	3		3			

First Semester Practical

Course Name: Language Lab. and Seminar Presentation
Course Code: HU191

Course Outcomes (COs):

After completion of the course students would be able to

CO1 Able to understand advanced skills of Technical Communication in English through Language Laboratory.

CO2 Able to apply listening, speaking, reading and writing skills in societal and professional life.

CO3 Able to demonstrate the skills necessary to be a competent Interpersonal communicator

CO4 Able to analyze communication behaviors.

CO5 Able to adapt to multifarious socio-economical and professional arenas with the help of effective communication and interpersonal skills.

CO-PO/PSO mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1							2		3	3		2	2	2	3
CO 2							2		3	3		2	2	3	2
CO 3							2		3	3		2	1	1	3
CO 4							2		3	3		2	-	1	2
CO 5							2		3	3		2			

Physics-1 Lab
Course Code: PH191

Course Outcomes (COs):

After completion of the course students would be able to

CO1 Demonstrate experiments allied to their theoretical concepts

CO2 Conduct experiments using LASER, Optical fiber, Torsional pendulum, Spectrometer

CO3 Analyze and participate as an individual and as a member or leader in groups in laboratory sessions actively.

CO4 Analyze experimental data from graphical representations, and to communicate effectively them in Laboratory reports including innovative experiments.

CO5 Develop critical thinking skills to solve real life challenges.

CO-PO/PSO mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
PH 191.1	2	3	2	3	3										
PH 191.2	2	3	2	3	3										
PH 191.3	2	3	2	3	3										
PH 191.4	2	3	2	3	3									2	2
PH 191.5	2	3	2	3	2										

Course Name: Basic Electronics Engineering Lab

Course Code: EC191

Course Outcome: After completion of this course student will be able to

EC191.1: Identify different types of passive and active electronic components, apply signals through signal generators and measure signals using CRO, Multimeter etc

EC191.2: Demonstrate and analyze the characteristics for PN junction diode, Zener diode.

EC191.3: Describe the regulator circuit and analyze the parametric observation

EC191.4: Demonstrate and analyze the characteristics for BJT, FET.

CO-PO/PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
EC191. 1	3	2	2	-	-	-	-	-	2	2	-	2	2	2	3
EC191. 2	3	3	2	-	-	-	-	-	3	2	-	2	2	2	3
EC191. 3	3	3	2	-	-	-	-	-	3	2	-	2	2	2	3
EC191. 4	3	3	3	-	-	-	-	-	3	2	-	2	2	2	2
5	3	2	3	-	-	-	-	-	3	2	-	2	2	2	3

Course Name: Workshop Practice
Course Code: ME191

Course Outcome: Upon successful completion of this course, the student will be able to:

1. Gain basic knowledge of Workshop Practice and Safety useful for our daily living.
2. Understand the use of Instruments of a pattern shop like Hand Saw, Jack Plain, Chisels etc.
3. Apply and performing operations like such as Marking, Cutting etc used in manufacturing processes.
4. Analyse the various operations in the Fitting Shop using Hack Saw, various files, Scriber, etc to understand the concept of tolerances applicable in all kind of manufacturing.
5. Get hands on practice of in Welding and apply various machining processes which give a lot of confidence to manufacture physical prototypes in project works.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ME 191.1	3						2		2	2					
ME 191.2	3						2		2	2					
ME 191.3	3						2		2	2			2		2
ME 191.4	3						2		2	2			2		2
ME 191.5	3	2	2				2		2	2					

Second Semester Theory

Course Name: Mathematics-II

Course Code: M 201

Course outcomes:

CO1 Determine and recall the properties and formula related to Ordinary differential equations, Basic Graph Theory and Laplace transform.

CO2 Determine the solutions of the solutions of the problems related to Ordinary differential equations, Basic Graph Theory and Laplace transform.

CO3 ApplyappropriatemathematicaltoolsofOrdinarydifferentialequations,Basic Graph Theory and Laplace transform.

CO4 Analyze Engineering problems on Ordinary Differential Equations, Basic Graph Theory and Laplace transform.

CO5 Apply engineering solutions by using Ordinary differential equations, Basic Graph Theory and Laplace transform.

CO-PO/PSO mapping:

CO codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
M201. 1	3	3	2	-								2			
M201. 2	3	3	3	3								2			
M201. 3	3	3	3	3								2	2	2	2
M201. 4	3	3	3	3								2	2	2	2
M201. 5	3	3	3	3								2	2	2	2

Course Name: Chemistry

Course Code: CH201

Course Outcomes (COs):

After completion of the course students would be able to

CO1 Describe and apply fundamental concepts of the chemical thermodynamics to engineering applications

CO2 Ability to analyze & design different energy storage devices

CO3 Determine, analyze and interpret the structure of organic molecules using different spectroscopic techniques

CO4 Apply the knowledge of fuel, composites, polymers and organic reactions to different industries.

CO5 Evaluate theoretical and practical aspects relating to the transfer of chemical products from laboratories to the industrial scale, in accordance with environmental considerations.

CO-PO/PSO mapping:

CO codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
CH201. 1	**3**	**2**	**2**	**2**								**2**			
CH201. 2	**3**	**3**	**3**	**3**								**2**			
CH201. 3	**3**	**3**	**2**	**2**								**2**			
CH201. 4	**3**	**2**	**3**	**2**								**2**			
CH201. 5	**3**	**3**	**3**	**3**								**2**		2	2

Course Name: Basic Electrical Engineering

Course Code: EE201

Course Outcome: After completion of this course student will be able to

EE201.1: Understand the behavior of any electrical and magnetic circuits.

EE201.2: Formulate and solve complex AC, DC circuits.

EE201.3: Identify the type of electrical machine used for that particular application.

CO-PO/PSO mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EE 201.1	3	3	3			3			3		2	3	2	2
EE 201.2	3	3	2			2			3		1	3	1	2
EE 201.3	3	3	3			1			3		1	3	3	3

Course Name: Computer Fundamentals & Principle of Computer Programming

Course Code: CS 201

Course Outcomes (COs):

After completion of the course students would be able to

CO1 Understand the fundamental concept of Computer and mathematical knowledge and apply the min designing and analyzing solution to engineering problem.

CO2 Understand the basic concept of Cprogramming and use of data types/ operators/ input/ output function for developing and implementing complete program leading to solution of mathematical and engineering problem.

CO3 Use conditional branching, iteration, recursion and formulate algorithms and programs in solving mathematical/ scientific/ engineering problem and also analyze the same leading to lifelong learning.

CO4 Understand the concept of arrays, pointers, file and dynamic memory allocation and apply it for problem solving and also create new data types using structure, union and enum.

CO5 Understand how to decompose a problem in to functions and assemble into a complete program by means of modular programming possibly as a team.

CO-PO Mapping

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS201.1	3	3	3	2	2								**3**	**3**	**3**
CS201.2	3	2	2	2	2								3	3	3
CS201.3	3	3	3	2	2								3	3	3
CS201.4	3	3	3	2	2								3	3	3
CS201.5	3	3	3	2	2								3	3	3

Course Name: Engineering Thermodynamics & Fluid Mechanics

Course Code: ME 201

Course Outcome: Upon successful completion of this course, the student will be able to:

1. Get the Knowledge about thermodynamic equilibrium, heat & work transfer,
2. Understand the First law of Thermodynamics and its application.
3. Apply the basic concepts of Heat Engine, Entropy from Second law of thermodynamics.
4. Analyse the thermodynamic characteristics of a pure substance and its application in power cycles (Simple Rankine cycles, Air Standard cycles)
5. Evaluation of basic principles of fluid mechanics, and ability to analyze fluid flow problems with the application of the momentum and energy equations.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ME201.1	3	2		2								2	2	2	
ME201.2	3	3		2								2	2	3	
ME201.3	3	3		3								3	3	3	
ME201.4	3	3		3								3	3	3	
ME201.5	3	3		2								2	3	3	

Second Semester Practical

Course Name: Computer Fundamentals & Principle of Computer Programming Lab

Course Code: CS291

CourseOutcomes(COs):

After completion of the course students would be able to

CO1: Understand and propose appropriate command or function in running system or developing program for engineering and mathematical problems depending on the platform used evening changed environment leading to their lifelong learning.

CO2: Identify and propose appropriate data type, arithmetic operators, input/output functions and also conditional statements in designing effective programs to solve complex engineering problem using modern tools.

CO3: Design and develop effective programs for engineering and mathematical problems using iterative statements as well as recursive functions using modular programming approach possibly as a team maintaining proper ethics of collaboration.

CO4: Explain and organized atain arrays, strings and structures and manipulate them through programs and also define pointers of different types and use the min defining self-referential structures and also to construct and use files for reading and writing to and from leading to solution engineering and mathematical problem.

CO5: Prepare laboratory reports on interpretation of experimental results and analyse it for validating the same maintaining proper ethics of collaboration.

CO-PO/PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CS291. 1	3	3	3	3	3								3	3	3
CS291. 2	3	3	2	3	3								3	3	3
CS291. 3	3	3	3	3	3								3	3	3
CS291. 4	3	3	3	3	3								3	3	3
5	3	3	3	3	3								3	3	3

Chemistry-1 Lab

Code: CH291

Course Outcomes (COs):

After completion of the course students would be able to

CO1	Understand different types of instruments for estimation of small quantities chemicals used in industries, scientific and technical fields.
CO2	Analyze and determine the composition of liquid and solid samples working as an individual and also as a team member.
CO3	Analyze different water quality parameters considering public health and environment
CO4	Synthesize drug and polymer materials considering public health and environmental safety
CO5	Design innovative experiments applying the fundamental theory of chemistry.

CO-PO/PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CH291.1	2	2	3	2		2						2			
CH291.2	2	2	3	2		2						2			
CH291.3	2	2	3	2		2						2			
CH291.4	2	2	3	2		2						2			
CH291.5	3	3	3	3		2						2		2	2

Course Name: Basic Electrical Engineering Lab

Course Code: EE291

Course Outcome: After completion of this course student will be able to

EE291.1: Understand the response of any electrical circuit and network
EE291.2: Apply the operation of an electrical apparatus
EE291.3: Analyse a suitable measuring instrument for a given application
EE291.4: Evaluate the various parts and test of DC machine and transformer

CO-PO/PSO mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
EE 191.1	2	2	3	3					3	3		2	2	2
EE 191.2	3	3	2	3					3	3		3	2	2
EE 191.3	2	3	3	2					2	3		2	2	2

Course Name: Engg. Drawing & Graphics

Course Code: ME291

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Learn the basics of drafting
2. Understand the use of drafting tools which develops the fundamental skills of industrial drawings.
3. Apply the concept of engineering scales, dimensioning and various geometric curves necessary to understand design of machine elements.
4. Analyse the concept of projection of line, surface and solids to create the knowledge base of orthographic and isometric view of structures and machine parts.
5. Evaluate the design model to different sections of industries as well as for research & development.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME 291.1	2			2									2	2	2
ME 291.2	2			2									2	2	2
ME 291.3	3			2									2	2	2
ME 291.4	3			3									3	3	2
ME 291.5	3	2		3	2								3	3	2

Course Name: **Applied Thermodynamics**
Course Code: **ME301**

Course Outcomes: Upon successful completion of this course the student will be able to:

1. Understand the second law limitation of thermodynamic efficiencies and sort out realistic and unrealistic thermodynamic system claims.
2. Apply Entropy and Energy analysis of thermal systems to evaluate sustainability of practical equipments in industries.
3. Able to analyze the performance variables of vapor power and gas power cycles, evaluate losses and learn the modifications practiced in modern power sectors.
4. Get idea about gas compressors and evaluate the basics of Refrigeration & Air Conditioning to develop various project works.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME301.1	3	2	3	-	-	-	-	-	-	-	-	-	-	2	-
ME301.2	2	3	2	3	-	-	2	-	-	-	-	3	-	3	-
ME301.3	2	3	3	3	-	-	2	-	-	-	-	2	-	3	-
ME301.4	2	2	3	2	-	-	2	-	-	-	-	2	-	1	-
Avrg.	**2.25**	**2.5**	**2.75**	**2.66**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2.33**	**-**	**2.5**	**-**

Course Name: **Strength of Materials**
Course Code: **ME302**

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Understand the knowledge of mathematics in analyzing tensile and compressive strength as well as able to understand and identify compound stresses developed in a material.
2. Apply to determine shear force and bending moment for designing system components to meet desired characteristics from economic, environmental and social considerations.
3. Able to analyze the beam stresses for a safe and sustainable design application and apply in constructive projects.
4. Evaluate the effect of torsion on beams and columns for a variety of loading conditions which boosts industrial skills.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME302.1	3	3	-	3	-	-	-	-	-	-	-	-	3	-	-
ME302.2	2	3	3	3	-	-	-	-	-	-	-	2	3	-	-
ME302.3	3	3	-	3	-	-	-	-	-	-	-	-	3	-	-
ME302.4	3	3	-	3	2	-	-	-	-	-	-	-	3	-	-
Avrg.	**2.75**	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**3**	**-**	**-**

Course Name: **Fluid mechanics**
Course Code: **ME303**

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1. Get knowledge about fluid flow properties and analyze hydrostatic forces on flat or curved surfaces.
2. Apply the detailed analysis of kinematics and dynamics of fluid for laminar and turbulent flow and exploit the conservation equations for the flow regimes of practical interest.
3. Learn and analyse boundary layer theory for a variety of constraints and understand the basics of a turbulent flow.
4. Evaluate the basics of compressible flow and apply for dimensional analysis for practical prototyping.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME303.1	2	2	3	-	-	-	-	-	-	-	-	-	3	2	-
ME303.2	3	3	-	2	-	-	-	-	-	-	-	-	3	2	-
ME303.3	3	2	-	2	-	-	-	-	-	-	-	3	2	2	-
ME303.4	2	2	2	2	-	-	2	-	-	-	-	-	3	-	-
Avrg.	**2.5**	**2.25**	**2.5**	**2**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**3**	**2.75**	**2**	**-**

Course Name Electrical Machine
Course Code EE(ME)301

Course Outcome : On completion of the course students will be able to

1. Understand and remember the working of any electrical machine under loaded and unloaded conditions.
2. Apply and explain the principle of operation and performance of DC machine, Three Phase Induction Motor, Synchronous Machine and Fractional kW Motors.
3. Analyze the response of DC machine, Three Phase Induction Motor, Synchronous Machine and Fractional kW Motors.
4. Evaluate the operation of DC machine, Three Phase Induction Motor, Synchronous Machine and Fractional kW Motors.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2	PSO3
EE(ME) 301.1	2	3	2	3	2	2	-	-	-	-	-	-	-	3	2
EE(ME) 301.2	-	2	3	2	3	3	-	-	-	2	-	-	-	3	-
EE(ME) 301.3	2	3	3	2	3	-	3	-	-	-	-	-	-	2	-
EE(ME) 301.4	-	-	3	1	2	-	-	-	-	2	-	-	-	2	3
Avrg.	**2**	**2.66**	**2.75**	**2**	**2.5**	**2.5**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**2.5**	**2.5**

Course Name: Mathematics-III
Course Code: M(ME) 301

Course Outcome:
On successful completion of the learning sessions of the course, the learner will be able to

M(ME)301.1: Recall the distinctive characteristics of mathematical approaches like Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression, Ordinary Differential Equation, Partial Differential Equations.

M(ME)301.2: Understand the theoretical workings of mathematical approaches like Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression, Ordinary Differential Equations, and Partial Differential Equations to evaluate the various measures in related field.

M(ME)301.3: Apply various principles of Fourier Series & Fourier Transform, Calculus of Complex Variables, Probability Distribution, Correlation & Regression,

M(ME)301.4: Evaluate various principles of Differential Equations, Partial Differential Equations to solve various problems.

CO-PO/PSO mapping:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
M(ME) 301.1	-	3	-	2	-	-	-	-	-	-	-	-	3	-	-
M(ME) 301.2	-	3	2	2	-	-	-	-	-	-	-	2	3	-	-
M(ME) 301.3	-	3	2	2	-	-	-	-	-	-	-	-	2	-	-
M(ME) 301.4	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-
Avrg.	3	3	2	2	-	-	-	-	-	-	-	2	2.75	-	-

Course Name: **Physics-II**
Course Code: **PH-(ME)301**

Course Outcome:

At the end of the course students' should have the

CO1: ability to apply the knowledge of Electrostatics to explain actions of dielectrics Magnetism and semiconductor physics in data storage Schrödinger equation in physical problems including semiconductor devices Band theory explain electrical conductivity of metal, insulators and semiconductor
CO2: Ability to analyze Use of insulators and magnetic materials in modern electrical circuitry and storage purpose. The inability of direct measurement technique in quantum mechanics and role of operators The need of suitable theoretical methods to explain electron transport in all types of materials Role of defected solid structure in perspective of mechanical engineering
CO3: ability to design and realize Mathematical frame work for making measurements in quantum mechanical situation\ Mechanical engineering with new generation materials like Graphene
CO4: Ability to conduct experiments using Dielectric under alternating field Intrinsic semiconductor under electric and magnetic field Various types of magnetic materials Semiconductor Photovoltaic cell, Light emitting diodes, Light dependent resistor Band theory and electron transport in a semiconductor

CO-PO/PSO mapping:

CO	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
PH-(ME)301.1	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
PH-(ME)301.2	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
PH-(ME)301.3	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-
PH-(ME)301.4	2	-	2	-	-	-	-	-	-	-	-	-	3	-	-
Avrg.	2.25	2.66	2	-	-	-	-	-	-	-	-	-	2.75	-	-

Course Name: **PHYSICS-II Lab**
Course Code: **PH (ME) 391**

Course Outcome: At the end of the course students' should have the

CO1: ability to define, understand and explain instruments used in spectroscopy Oscilloscope (digital) Solenoidal field, Magnetization, demagnetization Cathitometer
CO2:ability to apply the knowledge of Hysteresis in magnetic storage Photovoltaic action in solar cell Band theory
CO3: Ability to analyze Role of magnetic field in changing resistance of a sample
CO4:Ability to conduct experiments using Intrinsic semiconductor Temperature sensor Photovoltaic cell, Light emitting diodes, Light dependent resistor Various types of magnetic materials Curie temperature of the given ferroelectric material

CO-PO/PSO mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
PH(ME) 391.1	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
PH(ME) 391.2	2	2	-	2	-	-	-	-	-	-	-	-	2	2	-
PH(ME) 391.3	2	3	2	2	-	-	-	-	-	-	-	-	3	2	-
PH(ME) 391.4	2	-	2	3	-	-	-	-	2	-	-	-	3	3	-
Avrg.	2.25	2.66	2	2.25	-	-	-	-	2	-	-	-	2.75	2.25	-

Course Name: Electrical Machines Lab
Course Code: ME (EE)391

Course Outcome: On completion of the course students will be able to

1. Understand and get the knowledge of working of any electrical machine under loaded and unloaded conditions.
2. Apply the response of DC machine, Three Phase Induction Motor, Synchronous Machine and Fractional kW Motors.
3. Troubleshoot and analyse the operation of DC machine, Three Phase Induction Motor, Synchronous Machine and Fractional kW Motors.
4. Evaluate the response of DC machine, Three Phase Induction Motor, Synchronous Machine and Fractional kW Motors.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME(EE)391.**1**	-		3	2	-	-	-	-	2	-	-	-	3	2	2
ME(EE)391.**2**	-	-	2	3	-	-	-	-	3	-	-	-	2	2	3
ME(EE)391.**3**	2	-	3	3	-	-	-	-	3	-	-	-	2	3	3
ME(EE)391.**4**	3	-	3	3				-	3	-	-	-	3	3	3
Avrg.	**2.5**	**-**	2.75	2.75				**-**	2.75	**-**	**-**	**-**	**2.5**	**2.5**	2.75

Course Name: **Strength of Material Lab**
Course Code: **ME 391**

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Understand to Measure tensile and compressive strength of a specimen for applying in a practical design based project work.
2. Understanding and apply the concept of bending in beams and to analyze the bending stresses which further build the foundation of using modern analysis softwares.
3. Analyse hardness, impact strength, fatigue strength to analyze the application of a specific material for a given design requirements for different loading conditions of structures or machines.
4. Evaluate the capacity of a material to withstand torsional stresses for a safe and sustainable design of machine elements.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3
ME391.1	3	2	3	2	-	-	-	-	-	-	-	-	2	2	-
ME391.2	3	2	2	3	-	-	-	-	-	-	-	-	3	2	2
ME391.3	2	3	3	2							-	-	2	-	**2**
ME391.4	2	3	3	3	-	-	-	-	-	-	-	-	2	2	-
Avrg.	**2.5**	**2.5**	**2.75**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.25**	**2**	**2**

Course Name: **Machine Drawing I**
Course Code: **ME 392**

Course outcomes: Upon successful completion of this course, the student will be able to:

CO1: To gain knowledge about the isometric view of a given three dimensional object/part.
CO2: To understand and draw the orthogonal projection of a solid body and assemble drawing using part drawings.
CO3: Apply and Evaluate various materials and Mechanical components conventionally.
CO4: Analyse and evaluate the shape and structure of different types of screws, keys and Couplings.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME392.1	3	2	3	-	-	-	-	-	-	-	-	-	3	-	2
ME392.2	3	2	3	-	-	-	-	-	-	-	-	-	3	-	2
ME392.3	2	3	2	-	-	-	-	-	-	-	-	-	2	-	2
ME392.4	3	2	3	-	-	-	-	-	-	-	-	-	3	-	3
Avrg.	2.75	2.25	2.75	-	-	-	-	-	-	-	-	-	2.75	-	2.25

Course Name: **Fluid Machinery**
Course Code: **ME401**

Course Outcomes: Upon successful completion of this course, students will be able to:
1. Understand the mechanism of jet propulsion for a variety of conditions and analyze it's effects for practical applications.
2. Learn the design and working principle of hydraulic turbines and apply in a practical case study or project work on hydel plants.
3. Analyze the working of centrifugal and reciprocating pumps and calculate their performance parameters of practical interest in a plethora of applications.
4. Get the knowledge and evaluate the working principles of various modern hydraulic machines for varied industrial applications.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME401.1	3	2	3	2	2	2	2	-	2	-	-	-	3	3	-
ME401.2	2	3	3	2	2	3	2	-	2	-	-	-	3	3	-
ME401.3	2	2	2	2	2	2	2	-	2	-	-	-	3	3	-
ME401.4	2	3	3	2	3	3	3	-	3	-	-	-	2	-	-
Avrg.	2.25	2.5	2.75	2	2.25	2.5	2.25	-	2.25	-	-	-	2.75	2.25	-

Course Name: **Primary Manufacturing Processes**
Course Code: **ME402**

Course Outcomes: Upon completion of this course, students will be able to:

1. Know and understand the basics of manufacturing processes and concerned behavior of material properties.
2. Learn and apply details of casting process, design of gating system and solidification for different molding design.
3. Analyse basic welding and forming techniques and modern improvements for sophisticated metal works.
4. Evaluate the basics of powder metallurgy to develop knowledge on modern nano-manufacturing for applied project works.

Course Articulation Matrix:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME402.1	3	2	-	2	-	-	-	-	-	-	2	-	2	-	3
ME402.2	3	3	3	2	-	-	-	-	-	-	2	-	2	-	2
ME402.3	3	3	2	3	-	-	-	-	-	-	3	-	2	-	3
ME402.4	3	3	-	2	-	-	-	-	-	-	2	-	-	-	3
Avrg.	**3**	**2.75**	**2.5**	**2.25**	**-**	**-**	**-**	**-**	**-**	**-**	**2.25**	**-**	**2**	**-**	**2.75**

Course Name: **Engineering Materials**
Course Code: **ME403**

Course Outcomes: Upon successful completion of the course the students will be able to:
1. Know and understand Different properties and classifications of materials that determine their applicability and concept of atomic structure, crystal structure, various imperfections in solids and solidifications.
2. Identify and apply the knowledge of Iron-carbon equilibrium phase diagram, isomorphous and eutectic phase diagrams and distinguish between steels, cast irons and various non-ferrous alloys and describe methods, purposes and control of various heat treatment processes.
3. Apply and evaluate the special characteristics and applications of various types of polymer, ceramic and Composites.
4. Illustrate and evaluate the brief idea about corrosion with their types and control procedures of changing different mechanical properties of metals.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME403.1	3	2	3	2	-	-	-	-	-	-	-	-	-	2	3
ME403.2	3	3	2	2	-	-	-	-	-	-	-	-	-	3	2
ME403.3	3	3	2	-	3	-	-	-	-	-	-	2	-	3	2
ME403.4	3	2	2	-	-	-	-	-	-	-	-	-	-	2	2
Avrg.	**3**	**2.5**	**2.25**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2.5**	**2.25**

Course Name: **Mechanism**
Course Code: **ME404**

Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Know and understand the basic relations between distance, time, velocity, and acceleration and distinguish between kinematic and kinetic motion.
2. Apply and Design basic gear trains, cam systems and also create a schematic drawing of a real-world mechanism.
3. Analyse and Determine the degrees-of-freedom (mobility) of a mechanism.
4. Evaluate the motion of a planar mechanism by using graphical and analytic methods.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME404.1	2	2	2	2	2	-	-	-	-	-	-	-	2	-	-
ME404.2	3	3	3	2	3	-	-	-	-	-	-	-	3	2	2
ME404.3	2	2	2	2	3	-	-	-	-	-	-	-	3	2	-
ME404.4	2	2	2	3	2	-	-	-	-	-	-	-	3	-	-
Avrg.	2.25	2.25	2.25	2.25	**2.5**	-	-	-	-	-	-	-	**2.75**	2	2

Course Name: **Numerical Methods**
Course Code:**M(CS)401**

Course outcome: On successful completion of the learning sessions, the learner will be able to:
M(ME)401.1: Recall the distinctive characteristics of various numerical techniques and the associated error measures.
M(ME)401.2: Understand and apply the theoretical workings of various numerical techniques and to solve the engineering problems.
M(ME) 401.3: Analyse and evaluate the principles of various numerical techniques to solve various problems.

CO-PO/PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO 1	PSO 2	PSO 3
M(CS) 401.1	-	3	-	-	-	-	-	-	-	-	-	2	3	-	
M(CS) 401.2	-	3	2	-	-	-	-	-	-	-	-	-	2	-	
M(CS) 401.3	-	-	3	-	-	-	-	-	-	-	-	2	2	-	

Course Name: **Numerical Methods Laboratory**
Course Code:**M(CS)491**

Course outcome: On successful completion of the learning sessions, the learner will be able to:
M(CS) 491.1: Apply the programming skills to solve the problems using multiple numerical approaches.
M(CS) 491.2: Analyze and evaluate if the results are reasonable, and then interpret and clearly communicate the results.

CO-PO/PSO mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P10	P11	P12	PSO 1	PSO 2	PSO 3
M(CS) 491.1	2	3	-	-	-	3	2	-	-	3	-	3	2	-	3
M(CS) 491.2	2	-	-	-	-	-	2	-	-	3	-	3	3	-	3
Avrg.	**2**	**3**	**-**	**--**	**-**	**3**	**2**	**-**	**-**	**3**	**-**	**3**	**2.5**	**-**	**3**

Course Name: **Fluid mechanics & Hydraulic Machines Lab**
Course Code: **ME491**

Course Outcomes: Upon successful completion of this course, the student will be able to:
1. Measure the coefficient of discharge for several flow measuring devices to explore the reasons of differences in theoretical calculation and practical measurements.
2. Run variety of hydraulic turbine and carry out their performance study useful hydel power plants.
3. Run pumps and analyse their behavior under given constraints.
4. Evaluate the frictional forces applicable in a flow channel to determine major and minor losses.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME491.1	3	-	3	-	-	-	-	-	-	-	-	-	3	3	-
ME491.2	2	3	2	-	-	-	-	-	-	-	2	-	3	2	-
ME491.3	1	3	3	-	-	-	-	-	-	-	-	-	3	2	-
ME491.4	2	3	3	-	-	-	-	-	-	-	-	-	2	2	-
Avrg.	**2**	**3**	**2.75**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**	**2.75**	**2.25**	**-**

Course Name:**Manufacturing Technology Lab**
Course Code: **ME492**

Course Outcome: Upon the completion of the course the student would be able to
1. Fabricate basic parts and assemblies using powered and non-powered machine shop equipment in conjunction with mechanical documentation.
2. Ascertain product and process quality levels through the use of precision measurement tools and statistical quality control charts.
3. Practice basic welding and forming techniques and modern improvements for sophisticated metal works.
4. Know the basics of powder metallurgy for applied project works.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME492.1	3	3	3	-	-	-	-	-	-	-	-	-	3	-	3
ME492.2	2	2	2	3	-	-	-	-	-	-	-	-	3	-	2
ME492.3	3	2	3	3	-	-	2	-	-	-	-	-	-	-	2
ME492.4	2	2	3	3	-	-	3	-	3	-	3	-	-	-	3
Avrg.	2.5	2.25	**2.75**	3	-	-	2.5	-	3	-	3	-	3	-	2.5

Course Name:**Material testing Lab**
Course Code: **ME493**

Course Outcome: Upon the completion of the course the student would be able to
1. Determine toughness value of industrial specimens.
2. Carry out various type of heat treatments of a given specimen to change associated mechanical properties and grain size
3. Find out surface or subsurface defects relevant to almost all manufacturing industries.
4. Measure the mechanical properties like drawability, endurance limit of a steel specimen necessary for material selection in design and development.

CO-PO/PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME494.1	3	3	2	-	-	-	-	-	-	-	-	-	3	2	3
ME494.2	3	-	2	-	-	-	-	-	-	-	-	3	3	2	2
ME494.3	3	-	2	-	-	-	3	-	-	-	-	-	2	2	3
ME494.4	3	2	3	-	-	-	-	-	-	-	-	-	2	3	2
Avrg.	3	2.5	2.25	-	-	-	3	-	-	-	-	3	2.5	2.25	2.5

Course Name:**Machine Drawing-II**
Course Code: **ME494**

Course Outcomes: After successful completion of the course, the student would be able to

1. Independently run Computer Aided Drafting software like AutoCAD.
2. Model basic two dimensional objects, modify and dimension them to form more complex machine parts of engineering importance.
3. Understand geometric construction and Solid Modeling concepts and techniques for both on Course and software.
4. Model three dimensional views of important machine parts and explore the plotting techniques for standard presentation.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME494.1	3	3	2	-	-	-	-	-	-	-	-	-	2	-	2
ME494.2	3	3	3	-	3	-	-	-	-	-	-	-	2	-	2
ME494.3	3	3	2	-	3	-	-	-	-	-	-	-	3	-	3
ME494.4	3	3	2	-	3	-	-	-	-	-	-	-	3	-	3
Avrg.	3	3	2.25	-	3	-	-	-	-	-	-	-	2.5	-	2.5

SEMESTER V-Theory

Course Name: Heat Transfer,
Course Code: ME 501

Course Outcomes: Upon successful completion of this course, the student will be able to:

1. Understand the basic laws & constraints of heat transfer to analyze problems involving steady state or transient heat conduction in simple geometries.
2. Apply the analytical solutions of free and forced convection problems to apply in modern research sectors of heat and mass transfer.
3. Analyze and evaluate the radiation heat transfer between black body and gray body surfaces and obtain numerical solutions of combined mode heat transfer problems in practice.
4. Analyze and evaluate the effectiveness of several type of heat exchanger and develop skills for industrial design solutions of complex problems.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME501.1	3	3	2	3	-	-	-	-	-	-	-	2	3	3	-
ME501.2	3	3	3	3	-	-	-	-	-	-	-	2	3	3	-
ME501.3	2	2	2	2	-	-	-	-	-	-	-	-	2	3	-
ME501.4	3	2	3	3	-	-	-	-	-	-	-	-	2	3	-
Avrg.	**2.75**	**2.5**	**2.5**	**2.75**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2.5**	**3**	**-**

Course Name: DESIGN OF MACHINE ELEMENTS-I,
Course Code: ME 502

Course Outcomes: Upon successful completion student will be able to:

1. Gain appreciation and understanding of the design function in mechanical engineering, the steps involved in designing and the relation of design activity with manufacturing activity.
2. Shall be able to choose proper materials to different machine elements depending on their physical and mechanical properties. Thus he shall be able to apply the knowledge of material science in real life usage.
3. Student shall gain a thorough understanding of the different types of failure modes and criteria. He will be able to analyse various failure theories and be able to judge which criterion is to be applied in which situation.
4. Student shall gain design knowledge of the different types of elements used in the machine design process. e.g., fasteners, shafts, couplings etc. and will be able to evaluate these elements for each application.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME502.1	3	2	3	2	2	-	-	-	2	-	-	-	2	-	2
ME502.2	2	2	2	2	-	-	-	-	-	-	-	-	2	-	2
ME502.3	2	3	3	3	2	-	-	-	-	-	-	-	3	-	3
ME502.4	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
Avrg.	**2.25**	**2.25**	**2.5**	**2.25**	**2**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**2.25**	**2**	**2.25**

Course Name: DYNAMICS OF MACHINES

Course Code: ME503

Course Outcomes: Upon successful completion student will be able to:

1. Understand forced and free vibration in mechanical systems and use mathematical models to evaluate dynamic forces involved in such systems.
2. Construct static or dynamic balancing rotating and reciprocating equipments to apply in all type of industries.
3. Analyze the design of governors and flywheels for establishing mechanical control over rotating mechanical linkages.
4. Evaluate the method of retaining the stability of Automobiles, Aeroplanes and ships using the understanding of gyroscopic effects.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME503.1	3	2	2	-	-	-	-	-	-	-	-	-	-	2	2
ME503.2	2	2	3	-	-	-	-	-	-	-	-	-	-	3	2
ME503.3	2	3	3	3	-	-	-	-	-	-	-	-	2	2	2
ME503.4	2	2	3	2	-	-	-	-	-	-	-	-	-	3	3
Avrg.	**2.25**	**2.25**	**2.75**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**2.5**	**2.25**

Course Name: Metrology and Measurement

Course Code: ME504

Course Outcome: Upon successful completion of this course Students will be able to

1. Demonstrate the knowledge and understand the length and angle measuring and apply for checking the quality of manufactured products.
2. Apply the knowledge of the instruments for displacement, temperature, pressure, load and force measurement based on their working principle and their uses in industries.
3. Analyse limit, fit & tolerance and calibrate some unknown parameter of engineering interest.
4. Evaluate the surface texture, flatness and roughness of a given specimen which is important in all kind of manufacturing.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME504.1	3	2	-	-	2	-	-	-	-	-	-	-	3	-	3
ME504.2	3	2	-	-	2	-	-	-	-	-	-	-	2	-	3
ME504.3	3	2	-	-	3	-	-	-	-	-	-	-	2	-	2
ME504.4	3	2	-	-	3	-	-	-	-	-	-	-	2	-	2
Avrg.	**3**	**2**	**-**	**-**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.25**	**-**	**2.5**

Course Name: REFRIGERATION & AIR CONDITIONING
Course Code: ME505A

Course Outcomes: After taking this course the students will be able to:

1. Understand and explain different types of Refrigeration cycles and its applications in multi compressor and multi evaporator systems.
2. Apply and evaluate the selection and design of different components of Refrigeration systems
3. Analyse the knowledge of psychometric processes and air conditioning systems.
4. Evaluate and design the air-conditioning system for a given conditions including refrigerating equipments as well as ducting systems.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME505 A.1	3	2	2	3	-	-	2	-	-	-	-	2	3	2	-
ME505 A.2	3	2	2	-	-	-	-	-	-	-	2	2	2	2	-
ME505 A.3	3	3	3	-	-	-	-	-	-	-	-	3	3	3	-
ME505 A.4	3	2	3	-	-	-	3	-	-	-	2	2	2	2	-
Avrg.	3	2.25	2.5	3	-	-	2.5	-	-	-	2	2.25	2.5	2.25	-

5th Semester - Practical Courses

Course Name: Heat Transfer Lab

Course Code:ME-591

Course Outcomes: Upon successful completion student will be able to:

1. Understand the problems involving steady state heat conduction in simple geometries.
2. Apply experimental solutions for problems involving free and forced convection
3. Analyse and differentiate radiation capabilities of black and grey surfaces by practical observation.
4. Evaluate performance of basic types of heat exchangers and solve complex industrial problems.

CO-PO/PSO mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME591.1	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
ME591.2	2	2	2	-	-	-	-	-	-	-	-	-	2	2	-
ME591.3	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
ME591.4	3	3	2	3	-	-	2	-	-	-	-	2	3	3	-
Avrg.	**2.75**	**2.75**	**2**	**3**	**-**	**-**	**2**	**-**	**-**	**-**	**-**	**2**	**2.75**	**2.75**	**-**

Course Name: Dynamics of Machines Lab

Course Code:ME-592

Course Outcomes: After taking this course the students should be able to:

1. Understand several type of vibrating systems by using vibration measuring instruments, vibration of continuous systems and random vibrations.
2. Apply methods of balancing of rigid rotors, reciprocating machines, flywheels, planar linkages and instruments.
3. Analyse the working principle of gyroscope and governors to apply in future projects
4. Evaluate the practical knowledge on Cam dynamics used in various industrial applications.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME592.1	3	3	3	-	-	-	-	-	-	-	-	2	-	2	3
ME592.2	3	3	2	3	3	-	-	-	-	-	-	-	-	2	3
ME592.3	2	3	3	2	-	-	-	-	2	-	-	-	-	-	2
ME592.4	3	-	3	2	-	-	-	-	-	-	-	-	-	-	2
Avrg.	**2.75**	**3**	**2.75**	**2.33**	**3**	**-**	**-**	**-**	**2**	**-**	**-**	**2**	**-**	**2**	**2.5**

Course Name: Metrology & Measurement Lab

Course Code:ME-593

Course Outcomes: Upon completion of this course Students are able to

1. Demonstrate and use different length measuring instruments like vernier calipers and micrometers.
2. Apply different angle measuring instrument like universal bevel protractor, sine bar
3. Analyse some unknown quantity or parameter of engineering interest.
4. Evaluate the surface quality of a given specimen which is important in all kind of manufacturing.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME593.1	3	2	-	3	2	-	-	-	-	-	-	-	3	-	3
ME593.2	3	2	-	2	2	-	-	-	-	-	-	-	2	-	3
ME593.3	3	2	-	3	3	-	-	-	-	-	-	-	2	-	2
ME593.4	3	2	-	2	3	-	-	-	-	-	-	-	2	-	2
Avrg.	**3**	**2**	**-**	**2.5**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.25**	**-**	**2.5**

Course Name: Refrigeration & Air Conditioning Lab;
Course Code: ME 594A

Course Outcomes: On successful completion of the course, the student will be able to,

1. Demonstrate a domestic refrigerator and identify its important components.
2. Apply and analyze the performance parameters of a vapor compression based refrigeration system
3. Analyse the components of a basic air conditioning setup and operate it to analyze its performance index.
4. Evaluate the components of a thermoelectric refrigeration setup and measure its coefficient of performance useful in future project applications.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME 594A.1	3	2	2	3	-	-	2	-	-	-	-	2	3	2	-
ME 594A.2	3	2	2	-	-	-	-	-	-	-	2	2	2	2	-
ME 594A.3	3	3	3	-	-	-	-	-	-	-	-	3	3	3	-
ME 594A.4	3	2	3	-	-	-	3	-	-	-	2	2	2	2	-
Avrg.	3	2.25	2.5	3	-	-	2.5	-	-	-	2	2.25	2.5	2.25	-

Course Name: Applied Fluid Mechanics Lab;

Course Code: ME 594C

Course Outcomes: On successful completion of the course, the student will be able to,

1. Understand and distinguish the nature of turbulence inside a flow at various flow velocities.
2. Apply the Stokes law by experimental investigation.
3. Analyse with hydro turbines and analyze their characteristics.
4. Evaluate the flow patterns of an open channel flow and understand its practical implications.

CO-PO/PSO mapping:

CO Codes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME594C.1	3	2	2	3	-	-	-	-	-	-	-	-	3	3	-
ME594C.2	3	-	2	2	-	-	-	-	-	-	-	-	3	-	-
ME594C.3	3	2	2	2	-	-	2	-	-	-	-	2	3	-	-
ME594C.4	3	2	3	2	-	-	3	-	-	-	-	2	3	3	-
Avrg.	3	2	2.25	2.25	-	-	2.5	-	-	-	-	2	3	3	-

6TH SEMESTER COURSES

THEORY COURSES

Course Name	:	Machining Principles and Machine Tools
Course Code	:	ME 601

Course Outcomes: After the completion of this course, the student should be able to:

1. Understand the cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting and oblique cutting.
2. Apply cutting mechanics to metal machining based on cutting force and power consumption.
3. Analyse the operations of lathe, milling machines, drill press, grinding machines, etc.
4. Evaluate cutting tool materials, tool geometries and appropriate machining processes and conditions for different metals.

CO-PO/PSO mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME601.1	3	2	3	2	-	-	2	-	-	-	-	-	2	-	2
ME601.2	2	3	3	2	-	-	2	-	-	-	-	-	2	-	-
ME601.3	2	3	-	2	-	-	2	-	-	-	-	-	3	-	-
ME601.4	3	2	3	3	2	-	3	-	-	-	-	-	2	-	2
AVG	**2.5**	**2.5**	**3**	**2.25**	**2**	**-**	**2.25**	**-**	**-**	**-**	**-**	**-**	**2.25**	**-**	**2**

Course Name	:	Design of machine elements-II
Course Code	:	ME 602

Prerequisite: ENGINEERING GRAPHICS, ENGINEERING MATERIALS

Course Outcomes (CO): Upon successful completion of this course, the student will be able to:

1. Demonstrate the knowledge of basic machine elements to withstand loads and deformations for a given application, while considering additional specifications.
2. Formulate and solve engineering problems based on design of spur gears with respect to tooth bending strength and surface strength specifications
3. Analyze the design of bearings using design charts and custom software and select appropriate bearings for an application using printed and electronic catalog data.
4. Evaluate shafts design, brakes and clutches subjected to static or dynamic loads and present their designs orally and in writing.

CO-PO/PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME 602.1	3	-	2	2	2	-	-	-	-	-	-	2	3	3	-
ME 602.2	2	3	3	3	2	-	-	-	-	-	-	3	3	3	3
ME 602.3	3	3	2	2	2	-	-	-	-	-	-	-	3	3	-
ME 602.4	2	3	3	3	3	-	-	-	-	-	2	-	2	-	3
AVG	**2.5**	**3**	**2.5**	**2.5**	**2.25**	-	-	-	-	-	**2**	**2.5**	**2.75**	**3**	**3**

Course Name	**:**	**I. C. Engines and Gas Turbines**
Course Code	**:**	**ME 603**

Course Outcomes: Upon completion of this course students will be able to

1. Get the knowledge of engine nomenclature, performance parameters and characteristics of different fuels to differentiate several types of I C engine designs.
2. Understand and apply real characteristics of engine performance parameters and several losses due to various operational constraints in the presence of fuel.
3. Analyse the performance and fuel economy trends with good accuracy, based on an in-depth analysis of the fuel air mixing and combustion process.
4. Evaluate modern injection systems, cooling & lubrication systems and supercharging to optimize the thermal efficiency and emission standards.

CO-PO/PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME603.1	2	2	2	2	-	-	-	-	-	-	-	-	3	2	-
ME603.2	3	3	3	-	-	-	2	-	-	-	-	-	3	2	-
ME603.3	3	-	-	2	-	-	3	-	-	-	-	3	3	2	-
ME603.4	2	-	-	2	-	-	-	-	-	-	-	-	-	3	-
AVG	2.5	2.5	2.5	2	-	-	2.5	-	-	-	-	3	3	**2.25**	-

1.

Course Name : Fluid Power Control
Course Code : ME 604C

Course Outcomes: Upon completion of this course students will be able to

1. Understand and explain the working principle of hydraulic and pneumatic systems.
2. Apply the performance of pumps and actuators used in control devices.
3. Analyse hydraulic valves in different industrial application.
4. Design and evaluate fluid powered control circuits and express through proper drawing.

CO-PO/PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME604 C.1	3	2	2	-	-	-	-	-	-	-	-	-	2	-	1
ME604 C.2	3	2	2	2	-	-	-	-	-	-	-	-	2	-	3
ME604 C.3	3	3	3	2	-	-	-	-	-	-	-	-	3	-	2
ME604 C4	3	3	2	2	-	-	-	-	-	-	-	-	**2**	-	3
AVG	**3**	**2.5**	**2.25**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2.25**	**-**	**2.25**

Course Name : Renewable Energy Systems
Course Code : ME 605A

Course Outcomes: On successful completion of the course, the learner will be able to

1. Create awareness among students about renewable sources of energy and application of renewable technologies in different areas of country.
2. Apply the concept of working principle of various renewable energy technologies and systems like solar, wind, tidal and geothermal resources.
3. Analyse the knowledge of Storage technologies from renewable energy sources.
4. Evaluate the need and application of alternative biofuels in the field of power production.

CO-PO/PSO mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2	PS O 3
ME605 A.1	3	2	-	-	-	3	3	-	-	-	-	-	-	2	2
ME605 A.2	3	2	-	-	-	3	3	-	-	-	-	-	-	2	3
ME605 A.3	3	3	-	-	-	3	3	-	-	-	-	-	-	2	-
ME605 A.4	3	2	-	-	-	3	3	-	-	-	-	-	-	-	-
AVG	3	**2.25**	-	-	-	3	3	-	-	-	-	-	-	2	2.5

Practical Courses

Course Name: Machining & Machine Tools Lab
Course Code: ME 691

Course outcomes: After completion of this course, the student should be able to:

1. Understand how to Measure cutting forces (P_Z and P_X or P_Y) in straight turning at different process parameters.
2. Apply measurement of average cutting temperature and surface roughness in turning under different speed – feed combinations.
3. Study and analyse chip formation (type, color & thickness) in turning mild steel and evaluation of role of variation of cutting velocity and feed on chip reduction coefficient.
4. Produce a straight toothed spur gear from a cast or forged disc and convert circular rod into square rod.

CO-PO/PSO mapping:

COs	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12	PS O1	PS O2	PS O3
ME69 1.1	3	2	3	2	-	-	2	-	-	-	-	-	2	-	2
ME69 1.2	2	3	3	2	-	-	2	-	-	-	-	-	2	-	-
ME69 1.3	2	3	-	2	-	-	2	-	-	-	-	-	3	-	-
ME69 1.4	3	2	3	3	2	-	3	-	-	-	-	-	2	-	2
AVG	**2.5**	**2.5**	**3**	**2.25**	**2**	**-**	**2.25**	**-**	**-**	**-**	**-**	**-**	**2.25**	**-**	**2**

C

Course Name: INTERNAL COMBUSTION ENGINE LAB (ME 693)
Course Code: ME 693

Course Outcomes: After the completion of this course, the student should be able to:
1. Understand the practical operation of 2 stroke and 4 stroke I.C engines using valve timing diagram
2. Apply the performance of multi cylinder engines with the variation of various performances like load and speed.
3. Analyse and determine the quality of Engine fuels by analyzing its calorific value.
4. Analyze and evaluate the constituents of combustion products for emission characteristics related to public safety.

CO-PO/PSO mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME693.1	2	2	2	2	-	-	-	-	-	-	-	-	3	2	-
ME693.2	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-
ME693.3	3	-	-	2	-	-	-	-	-	-	-	-	3	-	-
ME693.4	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-
AVG	2.5	2.5	2.5	2	-	-	-	-	-	-	-	-	3	2.5	-

7TH SEMESTER COURSES

Theory Courses

Course Name: Power Plant Engineering
Course Code: ME 701

Course Outcomes (CO):
Upon successful completion of this course, the student will be able to:
1. Know and understand performance of a variety of steam based thermal power cycles and understand the economics of a power plant.
2. Get detailed knowledge about part and parcel of a steam generator and apply the concept to design the mountings and accessories by analytical investigations.
3. Propose coal handling, air handling, ash handling and firing methods in a thermal power plant and analyse the involvement in further research areas for modernization.
4. Analyze and evaluate the working of steam nozzles and variety of turbines to carry out design based project works and solution of industrial problems.

CO-PO/PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME701.1	3	2	3	-	-	2	2	-	-	-	-	-	3	2	-
ME701.2	3	2	-	-	-	2	2	-	-	-	-	-	3	3	-
ME701.3	2	2	3	-	-	2	2	-	-	-	-	-	3	2	-
ME701.4	2	2	-	-	-	2	2	-	-	-	-	-	3	3	-
AVG	2.5	2	1.5	-	-	2	2	-	-	-	-	-	3	2.5	-

Course Name: Advanced Manufacturing Technology
Course Code: ME 702

Course Outcomes: After successful completion of the course, the student would be able to

1. Understand the principle of working, mechanism of metal removal in the nonconventional machining processes like AJM, WJM, and USM.
2. Apply the process parameters involved in machining process and analyze their effect on surface finish achieved in USM, ECM, and EDM.
3. Analyse the principles of Laser Beam Machining and an introduction to hybrid machining
4. Get an overview and evaluate the concept of rapid prototyping and use of 3D printing.

CO-PO/PSO mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2	PSO 3
ME702. 1	3	2	3	3	3	-	2	-	-	-	3	3	3	-	3
ME702. 2	3	2	2	2	3	-	-	-	-	-	2	2	3	-	-
ME702. 3	3	-	3	2	3	-	-	-	-	-	2	3	-	-	2
ME702. 4	3	3	2	2	2	-	2	-	-	-	2	2	3	-	-
AVG.	3	2.5	2.5	**2.2 5**	**2.75**	-	2	-	-	-	**2.25**	2.5	**2.25**	-	**1.25**

Course Name: Advanced Welding Technology
Course Code: ME 703A

Course Outcomes: Upon completion of this course, the student will be able to achieve:

1. Deeper knowledge of welding materials and technology of welding.
2. Application of different metals and their properties in welded constructions
3. Get knowledge and analyse the quality techniques at production by welding
4. Evaluate the knowledge of current computer systems and cost for welding operations

CO-PO/PSO mapping:

CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
ME703A. 1	3	3	3	3	-	-	-	-	-	-	-	-	3	-	3
ME703A. 2	3	2	2	3	-	-	-	-	-	-	-	-	3	-	-
ME703A. 3	3	3	3	3	-	-	-	-	-	-	-	-	-	-	2
ME703A. 4	3	2	2	-	-	-	-	-	-	-	-	-	3	-	-
AVG	3	2. 5	2.5	**2. 25**	-	-	-	-	-	-	-	-	**2.2 5**	-	**1.2 5**

Course Name: Operations Research
Course Code: ME 704 B

Course Outcomes:
On successful completion of the learning sessions of the course, the learner will be able to:

CODE	DESCRIPTION
ME704B.1	Understand the characteristics of different types of decision-making environments to formulate and solve a real-world problem as a mathematical programming model.
ME704 B.2	Apply the theoretical workings of appropriate decision making approaches and tools to identify the optimal strategy in competitive world.
ME704 B.3	Solve and analyse network models like the shortest path, minimum spanning tree, and maximum flow problems
ME704 B.4	Create and evaluate the model of a dynamic system as a queuing model and compute important performance measures.

CO-PO/PSO mapping:

POs / COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME704B.1	3	3	3	-	-	-	-	-	-	-	-	-	3	-	3
ME704 B.2	-	-	-	3	-	-	-	-	-	-	-	2	3	-	3
ME704 B.3	2	2	-	2	-	-	-	-	-	-	-	2	-	-	3
ME704 B.4	-	-	3	-	-	-	-	-	-	-	-	2	-	-	3
AVG.	2	2	3	2.5	-	-	-	-	-	-	-	2	**3**	**-**	**3**

Course Name: Energy Conservation & Management
Course Code: ME705 A

Course Outcomes: Upon successful completion of this course, students will be able to
CO 1: Obtain knowledge about energy conservation policy, regulations and business practices
CO 2: Apply and Design to improve the thermal efficiency by designing suitable systems for heat recovery and co-generation
CO 3: Analyze the energy audit methods learnt to identify the areas deserving tighter control to save energy expenditure
CO 4: Evaluate the cost- benefit analysis of various investment alternatives for meeting the energy needs of the organization.

CO-PO/PSO mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME705 A.1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	3
ME705 A.2	-	-	-	3	-	-	-	-	-	-	-	-	-	3	3
ME705 A.3	2	2	-	2	-	-	-	-	-	-	-	-	-	2	3
ME705 A.4	-	-	3	-	-	-	-	-	-	-	-	-	-	-	3
AVG.	2	2	3	2.5	-	-	-	-	-	-	-	-	-	2.5	**3**

Practical Courses

Course Name:Advanced Manufacturing Technology Laboratory
Course Code: ME791

Course outcomes: After successful completion of the course, the student would be able to

1. Program a CNC turning or milling machine for preparing a job.
2. Study any nonconventional machining process and 3D printing.
3. Analyze the principles of Robot programming and carryout handson practice
4. Evaluate the process parameters involved in CNC machining

CO-PO/PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME791.1	3	3	3	3	3	-	2	-	3	-	-	-	3	-	3
ME791.2	3	2	2	2	3	-	-	-	2	-	-	-	3	-	2
ME791.3	3	3	3	2	3	-	-	-	2	-	-	-	-	-	3
ME791.4	3	2	2	2	2	-	2	-	2	-	-	-	3	-	2
Avrg.	3	2.5	2.5	2.25	**2.75**	-	2	-	2.25	-	-	-	**2.25**	-	2.5

Course Name:ADVANCED WELDING LAB

Course Code: ME 793A

Course Outcomes: Upon completion of this course, the student will be able to achieve:

1. Understanding of welding materials in MIC and TIG.
2. Apply the knowledge of different metals and their properties in welded constructions
3. Analyse quality techniques at production by welding
4. Practice of resistance welding.

CO-PO/PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME793A.1	3	3	3	3	-	-	-	-	-	-	-	-	3	-	2
ME793A.2	3	2	2	2	-	-	-	-	-	-	-	-	3	-	2
ME793A.3	3	3	3	2	-	-	-	-	-	-	-	-	-	-	2
ME793A.4	3	2	2	2	-	-	-	-	-	-	-	-	3	-	3
AVG	3	2.5	2.5	2.25	-	-	-	-	-	-	-	-	2.25	-	2.25

8TH SEMESTER COURSES

Theory Courses

Course Name: Automobile Engineering
Course Code: ME 802 A
Course Outcomes: After taking this course the students should be able to

1. Understand power train function and the translation of torques and speeds throughout
2. Calculate and apply dynamic wheel loads as influenced by accelerations, grades, aerodynamics and towed vehicles
3. Analyse the design and proportion a brake system and Understand the fundamentals of ride excitation sources and how to tune vehicle responses for best ride
4. Evaluate the knowledge of various suspension types and methods of analysis to determine their essential properties.

CO-PO/PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME802 A.1	2	2	2	-	-	-	-	-	-	-	-	-	3	2	-
ME802 A.2	3	3	3	-	-	3	2	-	-	-	-	-	3	3	-
ME802 A.3	3	-	-	-	-	3	3	-	-	-	-	-	3	-	-
ME802 A.4	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-
AVG.	2.5	2.5	2.5	-	-	3	2.5	-	-	-	-	-	3	2.5	-

Course Name: Maintenance Engineering
Course Code: ME803B

Course Outcomes: Upon successful completion of this course, students will be able to achieve:
1. Basic knowledge about types and procedure of maintenance, instruments and tools.
2. Understand and apply organizational and economic structure of maintenance.
3. Design and analyse the maintenance tools for various applications like bearings, drives, pumps, piping etc.
4. Evaluate the performance of tools associated with maintenance and lubrication.

CO-PO/PSO mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME803 B.1	2	-	2	-	-	3	-	-	-	-	2	-	-	3	2
ME803 B.2	3	-	3	-	-	3	-	-	-	-	3	-	-	3	3
ME803 B.3	3	-	3	-	-	3	-	-	-	-	3	-	-	3	-
ME803 B.4	2	-	2	-	-	3	-	-	-	-	2	-	-	2	-
AVG.	2.5	-	2.5	-	-	3	-	-	-	-	2.5	-	-	2.75	2.5

Course Name: Safety & Occupational Health
Course Code: ME 804 A

Course Outcomes: Upon successful completion of this course, students will be able to achieve:
1. Primary knowledge of industrial and occupational safety and accident prevention
2. Understand and apply occupational health and safety rules and regulations.
3. Analyze the safety management issues along with accident compensation acts.
4. Evaluate and manage real life problems in the industries related to accident prevention and safety.

CO-PO/PSO mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
ME804 A.1	-	-	-	-	-	3	-	3	2	-	2	-	-	3	2
ME804 A.2	-	-	-	-	-	2	-	3	3	-	2	-	-	2	3
ME804 A.3	-	-	-	-	-	2	-	3	3	-	-	-	-	3	-
ME804 A.4	-	-	-	-	-	2	-	2	2	-	-	-	-	-	-
AVG	-	-	-	-	-	2.25	-	2.75	2.5	-	2	-	-	**2**	**2.5**

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