



R-18

CURRICULUM ESSENTIALS

Handbook on Outcome Based Education

MECHANICAL ENGINEERING

NARULA INSTITUTE OF TECHNOLOGY
WWW.NIT.AC.IN

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 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

Sl No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	BS	M 101	Mathematics -I	3	1	0	4	4
2	BS	PH 101	Physics- I	3	0	0	3	3
3	ES	EC 101	Basic Electronics Engineering	3	0	0	3	3
4	HS	HU 101	English	2	0	0	2	2
Total of Theory							12	12
B. PRACTICAL								
5	BS	PH191	Physics- I Lab	0	0	3	3	1.5
6	ES	EC 191	Basic Electronics Engineering Lab	0	0	3	3	1.5
7	ES	ME 192	Workshop/Manufacturing Practices	0	0	3	3	1.5
8	PROJ	PR 191	PROJECT-IA	0	0	1	1	0.5
9	PROJ	PR 192	PROJECT-IB	0	0	1	1	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 181	Induction Program	0	0	0	0	
Total of Theory, Practical & Mandatory Activities/Courses							22	17.5

B. Tech Second Semester Curriculum

Sl No	Course Type	Course Code	Theory	Credit Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	BS	M 201	Mathematics -II	3	1	0	4	4
2	BS	CH 201	Chemistry	3	0	0	3	3
3	ES	EE 201	Basic Electrical Engineering	3	0	0	3	3
4	ES	CS 201	Programming for Problem Solving	3	0	0	3	3
5	ES	ME 201	Engineering Mechanics	3	0	0	3	3
Total of Theory							16	16
B. PRACTICAL								
6	ES	CS291	Programming for Problem Solving Lab	0	0	3	3	1.5
7	BS	CH 291	Chemistry Lab	0	0	3	3	1.5
8	ES	EE 291	Basic Electrical Engineering Lab	0	0	3	3	1.5
9	ES	ME 291	Engineering Graphics & Design	0	0	3	3	1.5
10	HS	HU 291	Language Lab	0	0	2	2	1
11	PROJ	PR 291	Project-II	0	0	1	1	0.5
12	PROJ*	PR 292	Innovative activities-I	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
1 3	MC	MC 281	NSS/ Physical Activities/Meditation & Yoga/Photography/ Nature Club	0	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							34	24

B. Tech Third Semester Curriculum

SL No	Course Type	Course Code	Theory	Contact Hours/Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	ME 301	Engineering Thermodynamics	3	0	0	3	3
2	PC	ME 302	Strength of Material	3	0	0	3	3
3	PC	ME 303	Fluid Mechanics	3	0	0	3	3
4	PC	ME 304	Materials Engineering	3	0	0	3	3
5	BS	M 301	Mathematics -III	3	1	0	4	4
6	BS	PH(ME)301	Physics - II	3	0	0	3	3
Total of Theory							19	19
B. PRACTICAL								
7	PC	ME 391	Material Testing Lab	0	0	3	3	1.5
8	PC	ME 392	Machine Drawing	0	0	3	3	1.5
9	BS	PH(ME)391	Physics – II Lab	0	0	2	2	1
10	PROJ	PR 391	Project-III	0	0	2	2	1
11	PROJ*	PR 392	Innovative activities-II	0	0	0	1	0.5
C. MANDATORY ACTIVITIES / COURSES								
12	MC	MC 301	Environmental Science	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							32	24.5

B. Tech Fourth Semester Curriculum

Sl No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	ME401	Fluid Machinery	3	0	0	3	3
2	PC	ME402	Manufacturing Process	3	0	0	3	3
3	PC	ME403	Kinematics & Dynamics of Machines	3	0	0	3	3
4	PC	ME404	Applied Thermodynamics	3	0	0	3	3
5	ES	ME405	Data Structure and algorithm	2	0	0	2	2
6	ES	M(ME)401	Numerical Methods	2	0	0	2	2
Total of Theory							16	16
B. PRACTICAL								
7	PC	ME491	Fluid Mechanics & Fluid Machines Lab	0	0	3	3	1.5
8	PC	ME492	Manufacturing Process Lab	0	0	3	3	1.5
9	PC	ME493	Dynamics of Machine Lab	0	0	3	3	1.5
10	PROJ	PR 491	Project-IV	0	0	2	2	1
11	PROJ *	PR 492	Innovative activities-III	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
12	MC	MC401	Constitution of India	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							30	22

B. Tech Fifth Semester Curriculum

Sl No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	ME 501	Heat Transfer	3	0	0	3	3
2	PC	ME 502	Manufacturing Technology	3	0	0	3	3
3	PC	ME 503	Design of Machine Elements	3	0	0	3	3
4	PC	ME 504	Refrigeration and Air Conditioning	3	0	0	3	3
5	PE	ME 505	A. Composite Materials	3	0	0	3	3
			B. Solid Mechanics					
			C. Computer Aided Design					
Total of Theory							15	15
B. PRACTICAL								
6	PC	ME591	Heat Transfer and Refrigeration Lab	0	0	3	3	1.5
7	PC	ME592	Manufacturing Technology Lab	0	0	3	3	1.5
8	PROJ	PR 591	Project-V	0	0	2	2	1
9	PROJ *	PR 592	Innovative activities-IV	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 581	Technical Seminar Presentation	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							26	19.5

B. Tech Sixth Semester Curriculum

SI No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	ME601	Internal Combustion Engine and Gas Turbine	3	0	0	3	3
2	PE	ME602	A. Power Plant Engineering	3	0	0	3	3
			B. Finite Element Analysis					
			C. Total Quality Management					
3	OE	ME 603	A. Electrical Machines	3	0	0	3	3
			B. DataBase Management System					
			C. Internet Of Things					
4	OE	ME 604	A. Mechatronics Systems	3	0	0	3	3
			B. Computational Fluid Dynamics					
			C. Fluid Power control					
5	HS	HU601	Values & Ethics in Profession	2	0	0	2	2
Total of Theory							14	14
B. PRACTICAL								
6	PC	ME 691	Internal Combustion Engine Lab	0	0	3	3	1.5
7	OE	ME692	A. Mechatronics Systems Lab	0	0	3	3	1
			B. Computational Fluid Dynamics Lab					
			C. Fluid Power Control Lab					
7	PROJ	PR 691	Project-VI**	0	0	2	2	1
8	PROJ*	PR 692	Innovative activities-V	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 681	Group Discussion	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							22	18

B. Tech Seventh Semester Curriculum

Sl No	Course Type	Course Code	Theory	Contact Hours/Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	HS	HU 704	Principle of Management	2	0	0	2	2
2	PC	ME 701	Advanced Manufacturing Technology	3	0	0	3	3
3	PE	ME 702	A. Materials Handling	3	0	0	3	3
			B. Design Of Transmission System					
			C. Nuclear Power Generation & Supply					
4	PE	ME 703	A. Renewable Energy System	3	0	0	3	3
			B. Tribology					
			C. Reliability & Maintenance					
5	OE	ME 704	A. Operation Research	3	0	0	3	3
			B. Robotics					
			C. Biomechanics & Biomaterials					
Total of Theory							14	14
B. PRACTICAL								
6	PC	ME 791	Advanced Manufacturing Lab	0	0	3	3	1.5
7	PROJ	PR 791	Project-VII (Part 1)	0	0	6	6	3
8	PROJ	PR 792	Minor Project**	0	0	3	3	1.5
9	PROJ*	PR 793	Innovative activities-VI	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 781	Behavioural and Interpersonal Skills	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							29	20.5

B. Tech Eighth Semester Curriculum

Sl No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	HS	HU 803	Industrial & Financial Management	2	0	0	2	2
2	PE	ME 801	A. Automobile Engineering	3	0	0	3	3
			B. Turbomachinery					
			C. Gas Dynamics & Jet Propulsion					
3	OE	ME802	A. 3D Printing and Design	3	0	0	3	3
			B. Nanotechnology					
			C. Industrial Instrumentation					
			D. Energy Conservation & Management					
4	OE	ME803	A. Artificial Intelligence	3	0	0	3	3
			B. Safety & Occupational Health					
			C. Microprocessor in Automation					
			D. Introduction to Electric Vehicles					
Total of Theory							11	11
B. PRACTICAL								
5	PROJ	PR 891	Project-VIII (Part II)	0	0	0	6	3
C. MANDATORY ACTIVITIES / COURSES								
6	MC	MC 801	Essence of Indian Knowledge Tradition	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							20	14

Mandatory Credit Point=160

$$\text{Total Credit} = (17.5+24+24.5+22+19.5+18+20.5+14) = 160$$

Course Name: Mathematics-I

Course Code: M 101

Contact: 3:1:0

Total Contact Hours: 48

Credits: 4

Prerequisites:

The students to whom this course will be offered must have the concept of (10+2) standard matrix algebra and calculus.

Course Objectives:

The objective of this course is to disseminate the prospective engineers with techniques in matrix algebra and calculus. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

CO1	Understand and recall the properties and formulas 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:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	3	3	2	-								2	2	2	2
CO2	3	3	3	3								2	2	2	2
CO3	3	3	3	3								2	2	2	2
CO4	3	3	3	3								2	2	2	2
CO5	3	3	3	3								2	2	2	2

Course Name: Physics –I

Course Code: PH 101

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Pre requisites: Knowledge of Physics up to 12th standard.

Course Objective:

The aim of courses in Physics is to provide an adequate exposure and develop insight about the basic physics principles along with the possible applications. The acquaintance of basic principles of physics would help engineers to understand the tools and techniques used in the industry and provide the necessary foundations for inculcating innovative approaches. It can also create awareness of the vital role played by science and engineering in the development of new technologies. It also gives necessary exposure to the practical aspects, which is an essential component for learning sciences.

Course Outcomes:

CO1: Describe various types mechanical resonance and its electrical equivalence

CO2: Explain basic principles of Laser, Optical fibers and various types of semiconductors

CO3: Apply superposition to explain interference and diffraction as well as apply wave mechanics to attainment of Heisenberg's uncertainty principle

CO4: Analyze importance of light as a carrier of information and examine different crystallographic structures according to their co-ordination number and packing factors

CO5: Justify the need of a quantum mechanics as remedy to overcome limitations imposed by classical physics

CO-PO/PSO Mapping:

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

Course Name: Basic Electronics Engineering

Course Code: EC101

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites:

Electric current and voltage-D.C and A.C., Complex impedance, conductivity, resistivity, transformer charging and discharging of capacitor, active and passive elements.

Course Objective:

1. To understand the behavior of Conductors, Insulators, and Semiconductors based on energy-band theory and relevant problems.
2. To instill the knowledge of working principles of P-N Junction Diode, Zener diode and analyze their applications in the rectifier, clipper, clamper, regulator etc.
3. To familiarize with the characteristics of Bipolar junction transistor(BJT) under CE, CE, CC mode of operation and its biasing mechanisms.
4. To understand working principles of JFET, MOSFET and perform operations under CG, CS, CD configurations for parametric observation.
5. To determine the parameters due to the effect of feedback in amplifier to ,adder circuit , integrator and differentiator circuit using Operational Amplifier

Course Outcomes:

CO1	Demonstrate and understand the concept of Conductors, Insulators, and Semiconductors based on energy-band theory and analyze relevant problems
CO2	Apply the working principles of P-N Junction Diode, zener diode and analyze their applications in the rectifier, clipper, clamper, regulator etc.
CO3	Analyze characteristics of Bipolar junction transistor(BJT) under CE, CE, CC mode of operation and its biasing therein
CO4	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 201	3	3	2	-	-	-	-	-	2	-	-	2

Course Name: English
Course Code: HU101
Contact: 2:0:0
Total Contact Hours: 24
Credits: 2

Prerequisites: The course presupposes a high school level knowledge of English grammar, punctuation, and elementary to intermediate reading and writing skills.

Course Objectives: The basic objectives of this course are to impart professional communication skills in the globalized workplace context, to enable functional competence in reading and writing so as to create industry-ready personnel.

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:

COs	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			

Course Name: Basic Electronics Engineering Lab

Course Code: EC 191

Contact: 0:0:3

Credit: 1.5

Course Objective:

The objectives of this course are

1. To prepare the students to have a basic knowledge of active and passive components.
2. To build knowledge to distinguish pure and impure DC signals.
3. To grow measuring ability of signals through multi meter and CRO
4. To understand characteristics of proper biasing for BJT and FET.
5. To encourage in developing circuits using diodes, transistors, FETs and OPAMPs.

Course Outcomes:

CO1	Knowledge of Electronic components such as Resistors, Capacitors, Diodes, Transistors measuring equipment like DC power supply, Multimeter, CRO, Signal generator, DC power supply.
CO2	Analyse the characteristics of Junction Diode, Zener Diode, BJT & FET and different types of Rectifier Circuits.
CO3	Determination of input-offset voltage, input bias current and Slew rate, Common- mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
CO4	Able to know the application of Diode, BJT & OPAMP.

CO-PO/PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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
EC191.5	3	2	3	-	-	-	-	-	3	2	-	2	2	2	3

Course Name: Workshop/Manufacturing Practices

Course Code: ME 192

Contact: 0:0:3

Credit: 1.5

Prerequisite: Higher Secondary with Mathematics, Physics and Chemistry

Course Objectives:

To understand the basic knowledge of Workshop Practice and Safety. To identify and use of different hand tools and other instruments like Hack Saw, Jack Plane, Chisels etc. and operations like Marking, Cutting etc. To expose students to different types of manufacturing/fabrication processes

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	PO1 0	PO1 1	PO1 2	PSO1	PSO2	PSO3
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					

2nd Semester

Course Name: Mathematics - II

Course Code: M 201

Contact: 3:1:0

Total Contact Hours: 48

Credit: 4

Prerequisites: The students to whom this course will be offered must have the concept of (10+2) standard calculus.

Course Objectives: The objective of this course is to disseminate the prospective engineers with techniques in multivariable calculus, ordinary differential equations and Laplace transform. It aims to equip the students with concepts and tools at an intermediate to advanced level of mathematics and applications that they would find useful in their disciplines.

Course Outcomes:

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 problems related to Ordinary differential equations, Basic Graph Theory and Laplace transform.

CO3: Apply appropriate mathematical tools of Ordinary differential equations, 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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Pre requisites: Knowledge of Chemistry up to 12th standard.

Course Objective:

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Course Outcomes:

CO1: Able to describe the fundamental properties of atoms & molecules, atomic structure and the periodicity of elements in the periodic table

CO2: Able to apply fundamental concepts of thermodynamics in different engineering applications.

CO3: Able to apply the knowledge of water quality parameters, corrosion control & polymers to different industries.

CO4: Able to determine the structure of organic molecules using different spectroscopic techniques.

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

CO-PO/PSO Mapping:

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

Contact: 3:0:0

Total Contact hours: 36

Credits: 3

Prerequisites:

- Basic 12th standard Physics and Mathematics.
- Concept of components of electric circuits.

Course Objective:

To introduce the students to basic principles of DC and AC circuits, Electrical Machines and Electrical Systems.

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	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
EE 101.1	3	3	3			3			3		2	3	2	2	
EE 101.2	3	3	2			2			3		1	3	1	2	
EE 101.3	3	3	3			1			3		1	3	3	3	

Course Name: Programming for Problem Solving

Course Code: CS 201

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites: Number system, Boolean Algebra

Course Outcomes:

CO1	Understand and differentiate among different programming languages for problem solving.
CO2	Describe the way of execution and debug programs in C language.
CO3	Define, select, and compare data types, loops, functions to solve mathematical and scientific problem.
CO4	Understand the dynamic behavior of memory by the use of pointers.
CO5	Design and develop modular programs using control structure, selection structure and file.

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
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 Mechanics

Course Code: ME 201

Contacts: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites: Basic Concept of Physics

Course Objective:

This course teaches students how to apply Newtonian physics to relatively simple real life applications. This course covers statics, dynamics and elementary part of strength of materials.

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:

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

Course Name: Programming for Problem Solving Lab

Course Code: CS291

Contacts: 0:0:3

Credits: 1.5

Prerequisites: Number system, Boolean Algebra.

CourseOutcomes(COs):

After completion of the course students would be able to,

CO1: Understand and propose appropriate command or function in the running system or developing program for engineering and mathematical problems depending on the platform used even in a 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 sateam maintaining proper ethics of collaboration.

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

CO4: Prepare laboratory reports on interpretation of experimental results and analyse it for validating the same maintaining proper ethics of collaboration.

CO-PO/PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
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
CS291 .5	3	3	3	3	3								3	3	3

Course Name: Chemistry Lab

Course Code: CH 291

Contact: 0:0:3

Credits: 1.5

Prerequisites: Knowledge of Physics up to 12th standard.

Course Objective:

- Study the basic principles of pH meter and conductivity meter for different applications.
- Analysis of water for its various parameters & its significance in industries.
- Learn to synthesis Polymeric materials and drugs.
- Study the various reactions in homogeneous and heterogeneous medium.

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:

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

Course Code: EE291

Contact: 0:0:3

Credits: 1.5

Course Objective:

To impart and apply knowledge about the Basic Electrical Components, Machineries, Instruments and Safety measures.

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: Engineering Graphics & Design

Course Code: ME 291

Contact: 0:0:3

Credits: 1.5

Prerequisites: Basic knowledge of geometry

Course Objectives:

To learn detailed drawing and modeling of a system, component, or process which meets desired needs within realistic constraints. It will help students to use the techniques, skills, and modern engineering tools and communicate effectively.

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	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO2	PSO3
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: Lang. Lab. and Seminar Presentation

Course Code: HU 291

Contact: 0:0:2

Credit: 1

Pre requisites: Basic knowledge of LSRW skills.

Course Objective: To train the students in acquiring interpersonal communication skills by focussing on language skill acquisition techniques and error feedback.

Course Outcomes:

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 behaviours.

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

CO – PO Mapping :

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

Course Name: NSS/Physical Activities/ Meditation & Yoga/ Photography/Nature Club

Course Code: MC 281

Contact: 0:0:3

Course Objectives:

- To increase student awareness about the weaker and unprivileged sections of society
- To expose students to environmental issues and ecological concerns
- To make students self aware about their participatory role in sustaining society and the environment

DEPARTMENT OF MECHANICAL ENGINEERING
3RD SEM CURRICULUM

3rd Semester									
SL No	Course Type	Course Code	Theory	Contact Hours/Week				Credit Points	
				L	T	P	Total		
A. THEORY									
1	PC	ME 301	Engineering Thermodynamics	3	0	0	3	3	
2	PC	ME 302	Strength of Material	3	0	0	3	3	
3	PC	ME 303	Fluid Mechanics	3	0	0	3	3	
4	PC	ME 304	Materials Engineering	3	0	0	3	3	
5	BS	M 301	Mathematics -III	3	1	0	4	4	
6	BS	PH(ME)301	Physics - II	3	0	0	3	3	
Total of Theory								19	19
B. PRACTICAL									
7	PC	ME 391	Material Testing Lab	0	0	3	3	1.5	
8	PC	ME 392	Machine Drawing	0	0	3	3	1.5	
9	BS	PH(ME)391	Physics – II Lab	0	0	2	2	1	
10	PROJ	PR 391	Project-III	0	0	2	2	1	
11	PROJ*	PR 392	Innovative activities-II	0	0	0	1	0.5	
C. MANDATORY ACTIVITIES / COURSES									
12	MC	MC 301	Environmental Science	3	0	0	3		
Total of Theory, Practical & Mandatory Activities/Courses								32	24.5

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

3rd Semester

Course Name: Engineering Thermodynamics

Course Code: ME 301

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites: Physics (10+2 level)

Course Objectives:

To learn about work and heat interactions, and balance of energy between system and its surroundings

To learn about application of I law to various energy conversion devices

To evaluate the changes in properties of substances in various processes

To understand the difference between high grade and low grade energies and II law limitations on energy conversion

Course Outcomes:

CO1: Learn about the interrelationship of heat and work to draw an energy balance between a system and its surroundings.

CO2: Understand the second law limitation of energy conversion and differentiate realistic and unrealistic thermodynamic systems.

CO3: Carry out Entropy and Exergy analysis of thermal systems to evaluate sustainability of practical equipments in industries.

CO4: Evaluate the performance of energy conversion devices using utility thermodynamic cycles.

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	-
Avg.	2.25	2.5	2.75	2.66	-	-	2	-	-	-	-	2.33	-	2.5	-

Course Name: Strength of Materials Course

Code: ME 302

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Engineering Mechanics

Course Objectives:

To understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams, shafts, cylinders and spheres for various types of simple loads

To calculate the elastic deformation occurring in various simple geometries for different types of loading

Course Outcomes:

CO1: Recognize various types loads applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components

CO2: Evaluate the strains and deformation in materials that will result due to the elastic stresses developed within the materials for simple types of loading.

CO3: Quantify mechanical integrity and failure in materials

CO4: Analyze application of materials with respect to their strength and weakness.

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
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	-	-
Avg.	2.75	3	3	3	2	-	-	-	-	-	-	2	3	-	-

Course Name: Fluid Mechanics

Course Code: ME 303

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites: Physics and Mechanics (10+2 level)

Course Objectives: To introduce and explain fundamentals of Fluid Mechanics which is useful in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics, Heat Transfer, Power Plant etc.

Course Outcomes:

CO1: Get knowledge about fluid flow properties and analyze hydrostatic forces on flat or curved surfaces.

CO2: Explore 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.

CO3: Learn about boundary layer theory for a variety of constraints and understand the basics of a turbulent flow.

CO4: Explain 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: Materials Engineering

Course Code: ME 304

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Engineering Physics and Engineering Chemistry.

Course Objectives:

- a. Understanding of the correlation between the internal structure of materials, their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
- b. To provide a detailed interpretation of equilibrium phase diagrams
- c. Learning about different phases and heat treatment methods to tailor the properties of Fe-C alloys.

Course Outcomes:

CO1: Identify crystal structures for various materials and understand the defects in such structures

CO2: Analyze the effect of heat treatment of mechanical properties of a material

CO3: Understand how to tailor material properties of ferrous and non-ferrous alloys

CO4: Learn about advanced materials useful in modern industrial application.

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
Avg.	3	2.5	2.25	2	3	-	-	-	-	-	-	2	-	2.5	2.25

Course Name: Physics - II
Course Code: PH (ME)301
Contact: 3:0:0
Total contact hours: 36
Credits: 3

Prerequisites: Physics I

Course Outcomes:

- CO1: Explain electron transport in semiconductors using energy and theory.
- CO2: Apply Schrödinger equation in variety of atomic scale problems including nanomaterials.
- CO3: Analyze the physics of various kinds of electric and magnetic materials
- CO4: Justify the importance of Fermi energy level in turning electronic properties of various semiconductors

CO-PO/PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO2	2	2	-	-	-	-	-	-	-	-	-	-	2	-	-
CO3	2	3	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	2	-	-	-	-	-	-	-	-	-	3	-	-
Avrg.	2.25	2.66	2	-	-	-	-	-	-	-	-	-	2.75	-	-

Course Name: Materials Testing Laboratory

Course Code: ME 391

Contact: 0:0:3

Credits: 1.5

Prerequisites: Engineering Chemistry.

Course Objective:

To measure the mechanical properties of a material to understand the deformation behavior of materials and observe the microstructure of a material sample under heat treatment.

Course Outcomes:

1. To understand the deformation behavior of materials
2. To observe the microstructure of a material sample under heat treatment.
3. To measure the mechanical properties of a material

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
CO1	3	3	2	-	-	-	-	-	-	-	-	-	3	2	3
CO2	3	-	2	-	-	-	-	-	-	-	-	3	3	2	2
CO3	3	-	2	-	-	-	3	-	-	-	-	-	2	2	3
CO4	3	2	3	-	-	-	-	-	-	-	-	-	2	3	2
Avrg.	3	2.5	2.25	-	-	-	3	-	-	-	-	3	2.5	2.25	2.5

Course Name: **Machine Drawing**

Course Code: **ME 392**

Contact: **0:0:3**

Credits: **1.5**

Prerequisite: Basic knowledge of Machine elements, engineering drawing/drafting

Course Objective: The objective of this lab is to practically demonstrate the failure criteria of different mechanical elements or bodies.

Course Outcomes:

CO1: Gain knowledge about the isometric views of a given three dimensional object/part.

CO2: Understand and draw the orthogonal projection of a solid body and assemble drawing using part drawings.

CO3: Learn and practice 3D modeling of machine parts using AutoCAD/Solidworks/Catia.

CO4: Draft the shape and structure of different types of screws, keys and Couplings

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
1	3	3	2	-	-	-	-	-	-	-	-	-	2	-	2
2	3	3	3	-	3	-	-	-	-	-	-	-	2	-	2
3	3	3	2	-	3	-	-	-	-	-	-	-	3	-	3
4	3	3	2	-	3	-	-	-	-	-	-	-	3	-	3
Avrg.	3	3	2.25	-	3	-	-	-	-	-	-	-	2.5	-	2.5

Course Name: Physics – II Lab

Course Code: PH(ME)391

Contacts: 0:0:2

Credit: 1

Prerequisite: Physics – II Theory

Course Objectives: To enable students carry out several experiments on applied physics and apply the knowledge in innovative solution in mechanical engineering.

Course Outcomes:

CO1: Demonstrate experiments allied to their theoretical concepts

CO2: Conduct experiments using semiconductors , dielectric and ferroelectrics, ultrasounds

CO3: Classify various types of magnetic materials

CO4: Participate as an individual, and as a member or leader in groups in laboratory sessions actively

CO5: Analyze experimental data from graphical representations , and to communicate effectively them in Laboratory reports including innovative experiments

CO-PO/PSO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO2	2	2	-	2	-	-	-	-	-	-	-	-	2	2	-
CO3	2	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO4	2	-	2	3	-	-	-	-	2	-	-	-	3	3	-
Avg.	2.25	2.66	2	2.25	-	-	-	-	2	-	-	-	2.75	2.25	-

Course Name: Environmental Science

Course Code: MC301

Contact: 3:0:0

Total Contact Hours: 36

Prerequisite: Basic Chemistry

Course Objective:

- Be able to understand the natural environment and its relationships with human activities.
- Be able to apply the fundamental knowledge of science and engineering to assess environmental and health risk.
- Be able to understand environmental laws and regulations to develop guidelines and procedures for health and safety issues.
- Be able to solve scientific problem-solving related to air, water, noise & land pollution.

Course Outcomes

CO1: Able to understand the natural environment and its relationships with human activities.

CO2: To apply the fundamental knowledge of science and engineering to assess environmental and health risk.

CO3: To develop guidelines and procedures for health and safety issues obeying the environmental laws and regulations.

CO4: Acquire skills for scientific problem-solving related to air, water, noise & land pollution.

CO – PO/PSO Mapping:

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

4 th Semester								
Sl No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	ME401	Fluid Machinery	3	0	0	3	3
2	PC	ME402	Manufacturing Process	3	0	0	3	3
3	PC	ME403	Kinematics & Dynamics of Machines	3	0	0	3	3
4	PC	ME404	Applied Thermodynamics	3	0	0	3	3
5	ES	ME405	Data Structure and algorithm	2	0	0	2	2
6	ES	M(ME)401	Numerical Methods	2	0	0	2	2
Total of Theory							16	16
B. PRACTICAL								
7	PC	ME491	Fluid Mechanics & Fluid Machines Lab	0	0	3	3	1.5
8	PC	ME492	Manufacturing Process Lab	0	0	3	3	1.5
9	PC	ME493	Dynamics of Machine Lab	0	0	3	3	1.5
10	PROJ	PR 491	Project-IV	0	0	2	2	1
11	PROJ*	PR 492	Innovative activities-III	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
12	MC	MC401	Constitution of India	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							30	22

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

Innovative activities to be evaluated by the Program Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Course Name: Fluid Machinery

Course Code: ME 401

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Fluid Mechanics

Course Outcomes:

CO1: Understand the mechanism of jet propulsion for a variety of conditions and analyze it's effects for practical applications.

CO2: Learn the design and working principle of hydraulic turbines and apply in a practical case study or project work on hydel plants.

CO3: Analyze the working of various pumps and evaluate their performance of practical interest in a plethora of applications.

CO4: Utilize knowledge 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	-	-
Avg.	2.25	2.5	2.75	2	2.25	2.5	2.25	-	2.25	-	-	-	2.75	2.25	-

Course Name: Manufacturing Processes

Course Code: ME 402

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Materials Engineering

Course Outcomes:

CO1: Understand the basics of manufacturing processes and concerned behavior of material properties.

CO2: Explain various casting processes for different molding designs and forming techniques for metal works.

CO3: Understand welding methods and analyze solid or liquid state joining

CO4: Analyze the principle of cutting tools and practice machining processes

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	-	2	-	-	-	-	-	-	2	-	2	-	3
CO2	3	3	3	2	-	-	-	-	-	-	2	-	2	-	2
CO3	3	3	2	3	-	-	-	-	-	-	3	-	2	-	3
CO4	3	3	-	2	-	-	-	-	-	-	2	-	-	-	3
Avg.	3	2.75	2.5	2.25	-	-	-	-	-	-	2.25	-	2	-	2.75

Course Name: Kinematics & Dynamics of Machines

Code: ME 403

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Physics successful completion of this course Students will be able to

Course Outcomes:

CO1: Understand the kinematics and rigid- body dynamics of kinematically driven machine components

CO2: Understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link

CO3: Design and analyze cam and gear based mechanisms to generate specified output motion

CO4: Explore the mechanism of bearings and understand vibration based systems

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	-	2	2
CO2	2	2	3	-	-	-	-	-	-	-	-	-	-	3	2
CO3	2	3	3	3	-	-	-	-	-	-	-	-	2	2	2
CO4	2	2	3	2	-	-	-	-	-	-	-	-	-	3	3
Avg	2.25	2.25	2.75	2.5	-	-	-	-	-	-	-	-	2	2.5	2.25

Course Name: Applied Thermodynamics

Course Code: ME 404

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Engineering Thermodynamics

Course Outcomes:

CO1: Get a good understanding of various practical power cycles and heat pump cycles.

CO2: Analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers.

CO3: Understand phenomena occurring in high speed compressible flows and study the functioning and application of compressors.

CO4: Learn the concepts, types and working principles and define their different types of efficiencies

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	-	-	-	-	-	-	-	-	-	-	2	-
CO2	2	3	2	3	-	-	2	-	-	-	-	3	-	3	-
CO3	2	3	3	3	-	-	2	-	-	-	-	2	-	3	-
CO4	2	2	3	2	-	-	2	-	-	-	-	2	-	1	-
Avg	2.25	2.5	2.75	2.66	-	-	2	-	-	-	-	2.33	-	2.5	-

Course Name: Numerical Methods

Course Code: M(ME) 401

Contact: 2:0:0

Total Contact Hours: 24

Credits: 2

Prerequisite: Concept of differential Calculus and Algebra

Course Outcomes:

CO1	Recall the distinctive characteristics of various numerical techniques and the associated error measures
CO2	Understand the theoretical workings of various numerical techniques to solve the engineering problems and demonstrate error
CO3	Apply the principles of various numerical techniques to solve various problems

CO-PO/PSO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	P10	P11	P12	PSO1	PSO2	PSO3
CO1	-	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	-	3	2	-	-	-	-	-	-	-	-	-	2	-	-
CO3	-	-	3	-	-	-	-	-	-	-	-	2	2	-	-

Course Name: Fluid Mechanics & Fluid Machines Lab

Course Code: ME 491

Contact: 0: 0: 3

Credits: 1.5

Prerequisite: Fluid Mechanics and Fluid Machines

Course Outcomes:

CO1: Recall the coefficient of discharge for several flow measuring devices to explore the reasons of differences in theoretical calculation and practical measurements.

CO2: Demonstrate hydraulic turbine and carry out their performance.

CO3: Examine and understand pump working characteristics under given constraints.

CO4: Estimate frictional forces applicable in a flow channel to determine major and minor losses.

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	-	3	-	-	-	-	-	-	-	-	-	3	3	-
CO2	2	3	2	-	-	-	-	-	-	-	2	-	3	2	-
CO3	1	3	3	-	-	-	-	-	-	-	-	-	3	2	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-	2	2	-
Avg	2	3	2.75	-	-	-	-	-	-	-	2	-	2.75	2.25	-

Course Name: Manufacturing Process Lab

Course Code: ME 492

Contacts: 0: 0: 3

Credits: 1.5

Prerequisite: Manufacturing Process

Course Outcomes:

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:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	-	3
CO2	2	2	2	3	-	-	-	-	-	-	-	-	3	-	2
CO3	3	2	3	3	-	-	2	-	-	-	-	-	-	-	2
CO4	2	2	3	3	-	-	3	-	3	-	3	-	-	-	3
Avg.	2.5	2.25	2.75	3	-	-	2.5	-	3	-	3	-	3	-	2.5

Course Name: Dynamics of Machines Lab

Course Code: ME 493

Contact: 0:0:3

Credits: 1.5

Prerequisite: Kinematics & Theory of Machines

Course Outcomes:

CO1: Select several type of vibrating systems by using measuring instruments regarding vibration of continuous systems and random vibrations.

CO2: Demonstrate methods of balancing of rigid rotors, reciprocating machines, flywheels, planar linkages and instruments.

CO3: Define the working principle of gyroscope and governors to apply in future projects

CO4: Get practical knowledge on Cam dynamics used in various industrial applications.

CO – PO/PSO Mapping:

COs	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	-	-	-	-	-	-	-	-	2	-	2	3
CO2	3	3	2	3	3	-	-	-	-	-	-	-	-	2	3
CO3	2	3	3	2	-	-	-	-	2	-	-	-	-	-	2
CO4	3	-	3	2	-	-	-	-	-	-	-	-	-	-	2
Avg.	2.75	3	2.75	2.33	3	-	-	-	2	-	-	2	-	2	2.5

5th Semester								
Sl No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	ME 501	Heat Transfer	3	0	0	3	3
2	PC	ME 502	Manufacturing Technology	3	0	0	3	3
3	PC	ME 503	Design of Machine Elements	3	0	0	3	3
4	PC	ME 504	Refrigeration and Air Conditioning	3	0	0	3	3
5	PE	ME 505	A. Composite Materials	3	0	0	3	3
			B. Solid Mechanics					
			C. Computer Aided Design					
Total of Theory							15	15
B. PRACTICAL								
6	PC	ME591	Heat Transfer and Refrigeration Lab	0	0	3	3	1.5
7	PC	ME592	Manufacturing Technology Lab	0	0	3	3	1.5
8	PROJ	PR 591	Project-V	0	0	2	2	1
9	PROJ*	PR 592	Innovative activities-IV	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 581	Technical Seminar Presentation	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							26	19.5

* Students may choose either to work on participation in Hackathons etc. Development of new product/ Business Plan/ registration of start-up.

Students may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry/ Long Term goals under rural Internship. (Duration 4-6 weeks)

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Course Name: Heat Transfer
Course Code: ME 501
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite: Thermodynamics, Fluid mechanics,

Course Outcomes:

CO1: Understand the basic laws & constraints of heat transfer to analyze problems involving steady state or transient heat conduction in simple geometries.

CO2: Survey the analytical solutions of free and forced convection problems to apply in modern research sectors of heat and mass transfer.

CO3: Evaluate the radiation heat transfer between black body and gray body surfaces and obtain numerical solutions of combined mode heat transfer problems in practice.

CO4: Analyze the effectiveness of several type of heat exchanger and develop skills for industrial design solutions regarding boiling and condensation.

CO – PO/PSO Mapping:

COs	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	3	-	-	-	-	-	-	-	2	3	3	-
CO2	3	3	3	3	-	-	-	-	-	-	-	2	3	3	-
CO3	2	2	2	2	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	3	3	-	-	-	-	-	-	-	-	2	3	-
Avg.	2.75	2.5	2.5	2.75	-	-	-	-	-	-	-	2	2.5	3	-

Course Name: Manufacturing Technology

Course Code: ME 502

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Materials Engineering

Course Outcomes:

CO1: Understand the basics of tooling needed for manufacturing

CO2: Explain the dimensional accuracy and tolerances of products

CO3: Explore and use the knowledge of the assembly of different components in practical projects

CO4: Apply the optimization methods in manufacturing

CO – PO/PSO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	-	2	-	-	-	3	3	3	-	3
CO2	3	2	2	2	3	-	-	-	-	-	2	2	3	-	-
CO3	3	-	3	2	3	-	-	-	-	-	2	3	-	-	2
CO4	3	3	2	2	2	-	2	-	-	-	2	2	3	-	-
Avg	3	2.5	2.5	2.25	2.75	-	2	-	-	-	2.25	2.5	2.25	-	1.25

Course Name: Design of Machine Elements

Course Code: ME 503

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Materials Engineering, Strength of Materials

Course Outcomes:

CO1: Explore mechanics of materials based failure criteria for the safety-critical design of machine components and applicability of empirical design principles, codes and standards.

CO2: Design shafts, brakes and clutches subjected to static or dynamic loads and present their designs orally and in writing.

CO3: Gain design knowledge of the different types of elements like shafts, couplings, fasteners and will be able to design these elements for each application.

CO4: Formulate and solve engineering problems based on design of various type of joints and transmission drives like gears, belt and chain drives

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	2	2	-	-	-	2	-	-	-	2	-	2
CO2	2	2	2	2	-	-	-	-	-	-	-	-	2	-	2
CO3	2	3	3	3	2	-	-	-	-	-	-	-	3	-	3
CO4	2	2	2	2	-	-	-	-	-	-	-	2	2	2	2
Avg	2.25	2.25	2.5	2.25	2	-	-	-	2	-	-	2	2.25	2	2.25

Course Name: Refrigeration & Air Conditioning

Course Code: ME504

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Applied Thermodynamics

Course Outcomes:

CO1: Explain different types of Refrigeration cycles and its applications in multi compressor and multi evaporator systems.

CO2: Evaluate the selection and design of different components of Refrigeration systems

CO3: Interpret the knowledge of psychometric processes and air conditioning systems.

CO4: Design the air-conditioning system for a given conditions including refrigerating equipments as well as ducting systems.

CO – PO/PSO Mapping:

COs	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	2	2	3	-	-	2	-	-	-	-	2	3	2	-
CO2	3	2	2	-	-	-	-	-	-	-	2	2	2	2	-
CO3	3	3	3	-	-	-	-	-	-	-	-	3	3	3	-
CO4	3	2	3	-	-	-	3	-	-	-	2	2	2	2	-
Avg	3	2.25	2.5	3	-	-	2.5	-	-	-	2	2.25	2.5	2.25	-

Course Name: Composite Materials

Course Code: ME505A

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Engineering Materials

Course Outcomes:

CO1: Know the structure and basic properties of composite and nano-composite materials.

CO2: Explore and understand the several methods of composite fabrication.

CO3: Predict the characteristics and performance of composite materials.

CO4: Apply varying composite materials in automotive, aerospace and other applications.

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	3	-	-	-	-	-	-	-	3	-	3	-	-
CO2	2	-	-	-	2	-	-	-	-	-	2	-	3	-	2
CO3	2	3	2	-	-	-	-	-	-	-	2	-	3	-	3
CO4	2	-	2	-	2	-	-	-	-	-	2	-	2	-	3
Avg	2.25	2.5	2.33	-	2	-	-	-	-	-	2.25	-	2.75	-	2.636

Course Name: Solid Mechanics
Course Code: ME 505 B
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite: Strength of Materials

Course Outcomes:

CO1: Understand the theory of elasticity including strain/displacement and Hooke's law relationships

CO2: Analyze solid mechanics problems using classical methods and energy methods;

CO3: Solve the problems in mechanical members like cylinder, disc etc under different types of loading.

CO4: Apply various failure criteria for general state of stress at points.

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	3	-	3	-	-	-	-	-	-	-	-	3	-	-
CO2	2	3	3	3	-	-	-	-	-	-	-	2	3	-	-
CO3	3	3	-	3	-	-	-	-	-	-	-	-	3	-	-
CO4	3	3	-	3	2	-	-	-	-	-	-	-	3	-	-
Avg	2.75	3	3	3	2	-	-	-	-	-	-	2	3	-	-

Course Name: Computer Aided Design

Course Code: ME 505 C

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Intro to Mechanical Engineering, Linear Algebra and concept of Programming

Course Outcomes:

CO1: Describe the mathematical basis of representing geometric entities like points, lines etc.

CO2: Create surface primitives using parametric modeling.

CO3: Apply geometric transformations on the created wireframe, surface and solid models.

CO4: Design and develop of mechanical components with CAD software.

CO – PO/PSO Mapping:

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

Course Name: Heat Transfer & Refrigeration Lab

Course Code: ME 591

Contact: 0: 0: 3

Credits: 1.5

Prerequisite: Heat Transfer, Refrigeration & Air Conditioning

Course Outcomes:

CO1: Evaluate the problems involving steady state conduction and convection in simple geometries.

CO2: Differentiate radiation capabilities of black and grey surfaces by practical observation

CO3: Analyze the effectiveness of heat exchanger and develop skills for industrial design solutions.

CO4: Design and evaluate the performance of refrigeration and air-conditioning systems

CO – PO/PSO Mapping:

COs	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	-	-	-	-	-	-	-	-	-	2	3	3	-
CO2	2	2	2	-	-	-	-	-	-	-	-	-	2	2	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-	3	3	-
CO4	3	3	2	3	-	-	2	-	-	-	-	2	3	3	-
Avg	2.75	2.75	2	3	-	-	2	-	-	-	-	2	2.75	2.75	-

Course Name: Manufacturing Technology Lab

Course Code: ME 592

Contacts: 0: 0: 3

Credits: 1.5

Prerequisite: Manufacturing Technology

Course Outcomes:

CO1: Demonstrate operation such as Turning, Facing, Threading, gear cutting on Centre Lathe and milling.

CO2: Analyze the cutting forces during metal cutting.

CO3: Understand principle of engineering metrology, measurement standards and instruments

CO4: Perform the job of an inspector and help the industries to produce quality products.

CO – PO/PSO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	2	-	3	-	-	-	3	-	3
CO2	3	2	2	2	3	-	-	-	2	-	-	-	3	-	2
CO3	3	3	3	2	3	-	-	-	2	-	-	-	-	-	3
CO4	3	2	2	2	2	-	2	-	2	-	-	-	3	-	2
Avg	3	2.5	2.5	2.25	2.75	-	2	-	2.25	-	-	-	2.25	-	2.5

Course Name: Technical Seminar Presentation

Course Code: MC 581

Contacts: 0:0:3

Credits: 0

Prerequisite: Basic Communication Skill

Course Outcomes:

CO1: Prepare technical seminar presentations in power point format which will be visually effective to reach any number of audiences.

CO2: Understand the methods of delivering and explaining technical terms through effective diagram selection and use of white board.

CO3: Analyze all core areas of Mechanical Engineering for variety of topics and enhance presentation skill by increasing level of detailing.

CO4: Produce confidence to face any audience, communicate with them in a disciplined manner and reply queries patiently

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

6th Semester								
Sl No	Course Type	Course Code	Theory	Contact Hours /Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	PC	ME601	Internal Combustion Engine and Gas Turbine	3	0	0	3	3
2	PE	ME602	A. Power Plant Engineering	3	0	0	3	3
			B. Finite Element Analysis					
			C. Total Quality Management					
3	OE	ME 603	A. Electrical Machines	3	0	0	3	3
			B. Database Management System					
			C. Internet Of Things					
4	OE	ME 604	A. Mechatronic Systems	3	0	0	3	3
			B. Computational Fluid Dynamics					
			C. Fluid Power control					
5	HS	HU601	Values & Ethics in Profession	2	0	0	2	2
Total of Theory							14	14
B. PRACTICAL								
6	PC	ME 691	Internal Combustion Engine Lab	0	0	3	3	1.5
7	OE	ME 692	A. Mechatronics Systems Lab	0	0	3	3	1
			B. Computational Fluid Dynamics Lab					
			C. Fluid Power control Lab					
7	PROJ	PR 691	Project-VI**	0	0	2	2	1
8	PROJ*	PR 692	Innovative activities-V	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 681	Group Discussion	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							22	18

*Students may choose either to work on participation in all the activities of Institute's Innovation Council for eg: IPR workshop/ Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

** Design and Modelling of 3D Machine Elements using AUTOCAD/SOLIDWORKS/CATIA/CREO

Innovative activities to be evaluated by the Programme Head/ Event coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

Course Name: Internal Combustion Engine and Gas Turbine

Course Code: ME 601

Course name: Internal Combustion Engine and Gas Turbine

Course code: ME601

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Applied Thermodynamics, Fluid mechanics,

Course Outcomes:

CO1: Get the knowledge of engine nomenclature, performance parameters and characteristics of different fuels to differentiate several types of I C engine designs.

CO2: Understand real characteristics of engine performance parameters and several losses due to various operational constraints in the presence of fuel.

CO3: Predict performance and fuel economy trends with good accuracy, based on an in-depth analysis of the fuel air mixing and combustion process.

CO4: Develop an understanding of modern injection systems, cooling & lubrication systems and supercharging to optimize the thermal efficiency and emission standards.

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	2	2	2	2	-	-	-	-	-	-	-	-	3	2	-
CO2	3	3	3	-	-	-	2	-	-	-	-	-	3	2	-
CO3	3	-	-	2	-	-	3	-	-	-	-	3	3	2	-
CO4	2	-	-	2	-	-	-	-	-	-	-	-	-	3	-
	2.5	2.5	2.5	2	-	-	2.5	-	-	-	-	3	3	2.25	-

Course Name: Power Plant Engineering

Course Code: ME 602A

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Applied Thermodynamics

Course Outcomes:

CO1: Explore minute details of all components of coal based power plant including steam generation, fuel and ash handling equipment.

CO2: Understand the principle of steam and gas based turbines to analyze their performance for a of a variety of design conditions.

CO3: Describe brief functionalities of Nuclear, Hydel and other renewable energy based power plants.

CO4: Evaluate plant performance with the knowledge of plant economics.

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
CO1	3	2	3	-	-	2	2	-	-	-	-	-	3	2	-
CO2	3	2	-	-	-	2	2	-	-	-	-	-	3	3	-
CO3	2	2	3	-	-	2	2	-	-	-	-	-	3	2	-
CO4	2	2	-	-	-	2	2	-	-	-	-	-	3	3	-
Avg	2.5	2	1.5	-	-	2	2	-	-	-	-	-	3	2.5	-

Course Name: Finite Element Analysis

Course Code: ME 602B

Contact: 3:0:0

Total Contact Hours: 36L

Credit: 3

Course Outcomes:

CO 1: Understand of the fundamental theory of the FEA method.

CO 2: Develop the ability to generate the governing FE equations for systems governed by partial differential equations.

CO 3: Use of the basic finite element methods for structural applications using truss, beam frame, and plane elements.

CO 4: Analyze of the FE method and comparing result with FEA package like Ansys.

CO – PO/PSO Mapping:

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

Course Name: Total Quality Management

Course Code: ME 602C

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: The behavioral sciences, Supply Chain and Process analysis.

Course Outcomes:

CO1: Understand the concept of Quality

CO2: Operate the methodologies, methods, and tools of lean manufacturing system.

CO3: Identify requirements of quality improvement programs.

CO4: Organize for quality and development of quality culture through small group activities.

CO – PO/PSO Mapping:

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

Course Name **Electrical Machine**
Course Code **ME603A**
Course Credit **3:0:0**
Contact Hours **34 L**
Credit: 3

Pre-requisite Basic Electrical Engineering

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	2	3	2	3	2	2	-	-	-	-	-	-	-	3	2
CO 2	-	2	3	2	3	3	-	-	-	2	-	-	-	3	-
CO 3	2	3	3	2	3	-	3	-	-	-	-	-	-	2	-
CO 4	-	-	3	1	2	-	-	-	-	2	-	-	-	2	3
Avg	2	2.66	2.75	2	2.5	2.5	3	-	-	2	-	-	-	2.5	2.5

Course Name: Database Management System

Course Code: ME 603B

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisites:

1. Logic of programming language
2. Basic concepts of data structure and algorithms

Course Outcomes (COs):

CO1: Apply the knowledge of Entity Relationship (E-R) diagram for an application.

CO2: Create a normalized relational database model

CO3: Analyze real world queries to generate reports from it.

CO4: Determine whether the transaction satisfies the ACID properties.

CO5: Create and maintain the database of an organization.

CO-PO/PSO Mapping:

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

Course Name: Internet of Things

Course Code: ME 603C

Contact: 3:0:0

Total Contact Hours: 36L

Credit: 3

Prerequisites: Fundamental knowledge in computer networking and wireless sensor network.

Course Outcome:

CO1: To understand the concepts of Internet of Things.

CO2: To analyze basic protocols in wireless sensor network.

CO3: To design IoT applications in different domain and be able to analyze their performance.

CO4: To implement basic IoT applications on embedded platform.

CO-PO/PSO Mapping:

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

Course Name: Mechatronics Systems

Course Code: ME 604A

Contact: 3:0:0

Total Contact Hours: 36L

Credit: 3

Prerequisite: Fluid Mechanics, Basic Electronics

Course Outcomes

CO1: Describe Mechatronics systems and have an overview of the types of actuators.

CO2: Distinguish between various sensors, transducers, actuators and their applications.

CO3: Understand the basic concept of microprocessor.

CO4: Interpret various signal conditioning units, amplifiers, logic gates and their role in Programmable logic controllers.

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

Course Name : COMPUTATIONAL FLUID DYNAMICS

Course Code: ME 604B

Contact: 3:0:0

Total Contact Hours: 34L

Credit: 3

Prerequisite: Fluid Mechanics, Finite Element Methods

Course Outcomes:

CO1: Understand the conservation equations and boundary conditions of fluid flow for varying cases.

CO2: Explore and analyze finite difference and finite volume methods of discretization.

CO3: Apply several computational solution methods based on finite element analysis.

CO4: Recognize the need and application of new methods in computational fluid dynamics.

CO-PO/PSO Mapping:

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

Course Name: Fluid Power Control
Course Code: ME 604 C
Contact: 3:0:0
Total Contact Hours: 36
Credits: 3

Prerequisite: Fluid Mechanics, Basic Electronics

Course Outcomes:

CO1: Understand the working principle of hydraulic and pneumatic systems.

CO2: Analyze the performance of pumps and actuators used in control devices.

CO3: Apply hydraulic valves in different industrial application.

CO4: Design and evaluate fluid powered control circuits and express through proper drawing.

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	2	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	-	2	-	3
CO3	3	3	3	2	-	-	-	-	-	-	-	-	3	-	2
CO4	3	3	2	2	-	-	-	-	-	-	-	-	2	-	3
Avg.	3	2.5	2.25	2	-	-	-	-	-	-	-	-	2.25	-	2.25

Course Name: Values and Ethics in Profession

Course Code: HU 601

Contact: 2:0:0

Total Contact Hours: 24

Credit: 2

Prerequisites: Basic knowledge of engineering and management.

Course Outcome: On Completion of this course student will be able to

- CO1. Understand the core values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values.
- CO2. Understand the basic perception of profession, professional ethics, various moral issues
- CO3. Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field
- CO4. Aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.
- CO5. Acquire knowledge about various roles of engineers in variety of global issues and be able to apply ethical principles to resolve situations that arise in their professional lives.

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
CO1	2	2	2	2	-	-	-	-	-	-	-	-	3	2	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-	3	3	-
CO3	3	-	-	2	-	-	-	-	-	-	-	-	3	-	-
CO4	2	-	-	2	-	-	-	-	-	-	-	-	-	-	-
Avg	2.5	2.5	2.5	2	-	-	-	-	-	-	-	-	3	2.5	-

Course Name: Mechatronics lab
Course Code: ME692B
Contacts: 0: 0: 3
Credits: 2

Prerequisite: Fluid Mechanics, Basic Electronics, Mechatronics Theory

Course Outcomes:

CO1: Describe and demonstrate Mechatronics systems and overview of control systems & actuators.

CO2: Distinguish between various sensors, transducers and actuators and their applications.

CO3: To understand the basic concept of microprocessor and perform simple operations on it.

CO4: Identify various signal conditioning units, amplifiers, logic gates and their role in programmable logic controllers

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
CO1	1		2		1				2	1	2				
CO2	1		2		1					1	3	1	2		1
CO3	1		2		2					1	2				
CO4	2		3		1					1	3		1		1
Avg.	1.25		2.25		1.25				0.5	1	2.5	0.25	0.75		0.5

Course Name: Fluid Power Control Lab
Course Code: ME 692 C
Contacts: 0: 0: 3
Credits: 1

Prerequisite: Fluid Power Control

Course Outcomes:

CO1: Demonstrate the devices such as pumps, compressor, valves, actuators and sensors etc.

CO2: Differentiate hydraulic and pneumatic circuits.

CO3: Apply fluid control valves in different industrial applications.

CO4: Design and evaluate fluid powered control circuits and express through proper drawing.

CO – PO/PSO Mapping:

COs	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO1	3	2	2	-	-	-	-	-	-	-	-	-	2	-	1
CO2	3	2	2	2	-	-	-	-	-	-	-	-	2	-	3
CO3	3	3	3	2	-	-	-	-	-	-	-	-	3	-	2
CO4	3	3	2	2	-	-	-	-	-	-	-	-	2	-	3
Avg	3	2.5	2.25	2	-	-	-	-	-	-	-	-	2.25	-	2.25

Course Name: Group Discussion
Course Code: MC 681
Contact Hours: 2P
Credit: 0

Course Outcomes:

CO1: Communicate effectively in an interview

CO2: Grow leadership and negotiation skills.

CO3: Learn discipline, body language, positive attitude and ethics to follow whole life.

CO – PO/PSO Mapping:

CO Codes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	-	1	-	1	-	3	2	2
CO2	1	1	1	-	-	1	-	1	-	3	2	2
CO3	1	1	1	-	-	1	-	1	-	3	2	2

7 th Semester								
Sl No	Course Type	Course Code	Theory	Contact Hours/Week				Credit Points
				L	T	P	Total	
A. THEORY								
1	HS	HU 704	Principle of Management	2	0	0	2	2
2	PC	ME 701	Advanced Manufacturing Technology	3	0	0	3	3
3	PE	ME 702	A. Materials Handling	3	0	0	3	3
			B. Design Of Transmission System					
			C. Nuclear Power Generation & Supply					
4	PE	ME 703	A. Renewable Energy System	3	0	0	3	3
			B. Tribology					
			C. Reliability & Maintenance					
5	OE	ME 704	A. Operations Research	3	0	0	3	3
			B. Robotics					
			C. Biomechanics & Biomaterials					
Total of Theory							14	14
B. PRACTICAL								
6	PC	ME 791	Advanced Manufacturing Lab	0	0	3	3	1.5
7	PROJ	PR 791	Project-VII (Part 1)	0	0	6	6	3
8	PROJ	PR 792	Minor Project**	0	0	3	3	1.5
9	PROJ*	PR 793	Innovative activities-VI	0	0	0	0	0.5
C. MANDATORY ACTIVITIES / COURSES								
10	MC	MC 781	Behavioural and Interpersonal Skills	0	0	3	3	
Total of Theory, Practical & Mandatory Activities/Courses							29	20.5

*Students may choose either to work on participation in Hackathons etc. Development of new product/ Business Plan/ registration of start-up.

Students may choose to undergo Internship / Innovation / Entrepreneurship related activities. Students may choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations/ Micro/ Small/ Medium enterprises to make themselves ready for the industry/ Long Term goals under rural Internship. (Duration 4-6 weeks)

Innovative activities to be evaluated by the Programme Head / Event Coordinator based on the viva voce and submission of necessary certificates as evidence of activities.

** PR792 - Part Modelling, Assembly, Design & Simulation of Mechanical Systems based on Structural and Thermal Hydraulic analysis using ANSYS/SOLIDWORKS/CATIA/NASTRAN/SOLIDEDGE or similar software.

7TH SEMESTER COURSES

Theory Courses

Course Name: Principles of Management

Course Code: HU 704

Contact hour: 2L

Total contact hour- 24

Credits: 2

Prerequisites: NIL

Course outcome:

On completion of the course students will be able to

CO1: To recall and identify the relevance of management concepts.

CO2: To apply management techniques for meeting current and future management challenges faced by the organization

CO3: To compare the management theories and models critically to solve real-life problems in an organization.

CO4: To apply principles of management in order to execute the role as a manager in an organization.

CO – PO/PSO Mapping:

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

Course Name: Advanced Manufacturing Technology

Course Code: ME 701

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: Manufacturing Process.

Course Outcomes:

1. Learn the basics of automation and its application in flexible manufacturing systems.
2. Understand the principle of CNC machines and learn their programming language.
3. Evaluate the process parameters involved in the machining process and analyze their effect on surface finish achieved in various nonconventional processes.
4. Get an overview of rapid prototyping and use of 3D printing.

CO – PO/PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	3	-	2	-	-	-	3	3	3	-	3
CO2	3	2	2	2	3	-	-	-	-	-	2	2	3	-	-
CO3	3	-	3	2	3	-	-	-	-	-	2	3	-	-	2
CO4	3	3	2	2	2	-	2	-	-	-	2	2	3	-	-
Avg	3	2.5	2.5	2.25	2.75	-	2	-	-	-	2.25	2.5	2.25	-	1.25

Course Name: Materials Handling

Course Code: ME 702A

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Manufacturing Technology, Kinematics & Dynamics of Machines.

Course Outcomes:

CO1: Understand the importance of material handling and plant layout.

CO2: Study the design procedures of various material handling equipment & component.

CO3: Analyse the variety of load & selection of material handling system based on application through general analysis procedure.

CO4: Apply the fundamentals of load lifting, automation and auxiliary equipment in material handling with proper design consideration.

CO – PO/PSO Mapping:

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

Course Name: Design of Transmission Systems

Course Code: ME 702B

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: Theory of Machine

Course Outcomes:

1. Recognize the importance of transmission systems for engines and machines.
2. Design transmission systems for engines and machines.
3. Evaluate their abilities in Key areas such as car bodies, heavy machineries etc.
4. Analyze each part of transmission mechanism for optimum design.

CO – PO/PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	2			2		2			1	2
CO2	3	2	3			1					1	2
CO3	2	2	2	1		1					1	2
CO4	3	2	1	1		2		1			1	1

Course Name: NUCLEAR POWER GENERATION AND SUPPLY

Course Code: ME 702 C

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: Physics, Chemistry, Heat Transfer, Power plant Engineering.

Course Outcomes:

1. Detailed knowledge of nuclear reactor types and associated systems
2. Analyze variety of nuclear power plants based on fission and fusion.
3. Evaluate the safety assessments and waste management.
4. Design and simulate equivalent conditions for practical problem solving.

CO – PO/PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	1		1	1				1	1
CO2	2	1	1	2		2	1				1	2
CO3	2	2	3	1		3	2				1	2
CO4	1	1	1	1	2	3	2				2	2

Course Name : **Renewable Energy Systems**
Course Code : **ME 703A**
Contact : **3:0:0**
Total Contact Hours : **36**
Credits : **3**

Prerequisite: Thermodynamics, Power Plant Engineering

- 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. Understand the working principle of various renewable energy technologies and systems like solar, wind, tidal and geothermal resources.
 3. Explain the knowledge of Storage technologies from renewable energy sources.
 4. Recognize the need and application of alternative biofuels in the field of power production.

CO – PO/PSO Mapping:

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

Course Name: Reliability & Maintenance

Course Code: ME703C

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: Strength of Material, Machine Design, Measurement and Instrumentation

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

1. Get Basic knowledge about types and procedure of maintenance, instruments and tools.
2. Understand organizational and economic structure of maintenance.
3. Evaluate of performance of tools associated with maintenance and lubrication.
4. Design maintenance tools for various applications like bearings, drives, pumps, piping etc.

CO – PO/PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	-	2	-	-	3	-	-	-	-	2	-	-	3	2
CO2	3	-	3	-	-	3	-	-	-	-	3	-	-	3	3
CO3	3	-	3	-	-	3	-	-	-	-	3	-	-	3	-
CO4	2	-	2	-	-	3	-	-	-	-	2	-	-	2	-
Avg	2.5	-	2.5	-	-	3	-	-	-	-	2.5	-	-	2.75	2.5

Course Name: Operations Research

Course Code: ME 704 A

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: LPP

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

CODE	DESCRIPTION
CO1	Understand the characteristics of different types of decision-making environments to formulate and solve a real-world problem as a mathematical programming model.
CO2	Understand the theoretical workings of appropriate decision making approaches and tools to identify the optimal strategy in competitive world.
CO3	Solve network models like the shortest path, minimum spanning tree, and maximum flow problems
CO4	Create Model of a dynamic system as a queuing model and compute important performance measures.

Course Articulation Matrix:

POs	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
COs															
CO1	3	3	3	-	-	-	-	-	-	-	-	-	3	-	3
CO2	-	-	-	3	-	-	-	-	-	-	-	2	3	-	3
CO3	2	2	-	2	-	-	-	-	-	-	-	2	-	-	3
CO4	-	-	3	-	-	-	-	-	-	-	-	2	-	-	3
Avg	2	2	3	2.5	-	-	-	-	-	-	-	2	3	-	3

Course Name: Robotics

Course Code: ME 704 B

Contact: 3:0:0

Total Contact Hours: 36

Credits: 3

Prerequisite: Basic Electronics, mechanism, manufacturing technology.

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

CO1: Understand the various robot structures and their workspace.

CO2: Learn about robot kinematics.

CO3: Analyze the different control drives in robot operation system.

CO4: Apply programming for controlling the robotic operation.

CO – PO/PSO Mapping:

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

Course Name: Biomechanics & Biomaterials

Course Code: ME 704C

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: Engineering Mechanics, Materials engineering

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

1. Understand the fundamentals of biomechanics and its relation with human motion.
2. Apply a broad knowledge of different types of biomaterials including metals, polymers, ceramics and composites and their use in typical biomedical devices and clinical applications.
3. Design an implant using fundamental concept and modern engineering tools to develop hard tissue and soft tissue replacement materials by suitable material selection.
4. Analyze the design of various biocompatible implants and artificial organ to develop and improve Health Care Service to serve mankind and society.

CO – PO/PSO Mapping:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	1									2
CO2	2	2	1	1					1			3
CO3	1	2	2	1	2				2			3
CO4	1	3	3	2	1	2	1		1		2	3

Practical Courses

Course Name: Advanced Manufacturing Lab

Course Code: ME791

Contact: 0:0:3

Contact Hours: 36

Credit: 2

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. Evaluate the process parameters involved in CNC machining
3. Analyze the principles of Robot programming and carryout hands-on practice
4. Study any nonconventional machining process and 3D printing.

CO – PO/PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	2	-	3	-	-	-	3	-	3
CO2	3	2	2	2	3	-	-	-	2	-	-	-	3	-	2
CO3	3	3	3	2	3	-	-	-	2	-	-	-	-	-	3
CO4	3	2	2	2	2	-	2	-	2	-	-	-	3	-	2
Avg	3	2.5	2.5	2.25	2.75	-	2	-	2.25	-	-	-	2.25	-	2.5

Course Name: Behavioural & Interpersonal Skills

Course Code: MC-381

Contact: 3:0:0

Total Contact Hours: 36

Course Outcome:

CO1: It will equip the student to handle workplace interpersonal communication in an effective manner.

CO2: To enable students with strong oral and written interpersonal communication skills.

CO3: To prepare students to critically analyze workplace situations and take appropriate decisions.

CO4: To make students campus ready through proper behavioral and interpersonal grooming.

CO5: Integration of enhanced skill set to design and frame team based Project Report and Presentation.

8 th Semester								
Sl. No	Course Type	Course Code	Theory	Contact Hours /Week			Credit Points	
				L	T	P		Total
A. THEORY								
1	HS	HU 803	Industrial & Financial Management	2	0	0	2	2
2	PE	ME 801	A. Automobile Engineering	3	0	0	3	3
			B. Turbomachinery					
			C. Gas Dynamics & Jet Propulsion					
3	OE	ME802	A. 3D Printing and Design	3	0	0	3	3
			B. Nanotechnology					
			C. Industrial Instrumentation					
			D. Energy Conservation & Management					
4	OE	ME803	A. Artificial Intelligence	3	0	0	3	3
			B. Safety & Occupational Health					
			C. Microprocessor Application in Automation					
			D. Introduction to Electric Vehicles					
Total of Theory							11	11
B. PRACTICAL								
5	PROJ	PR 891	Project-VII (Part II)	0	0	0	6	3
C. MANDATORY ACTIVITIES / COURSES								
6	MC	MC 801	Essence of Indian Knowledge Tradition	3	0	0	3	
Total of Theory, Practical & Mandatory Activities/Courses							20	14

Course Name: Automobile Engineering

Course Code: ME 801A

Contact: 3:0:0

Contact Hours: 36

Credits: 3

Prerequisite: Thermodynamics, Kinematics & Theory of Machines.

Course Outcomes:

CO1: Understand the basic layout of an automobile.

CO2: Explain the operation of engine cooling, lubrication, ignition, electrical and air conditioning systems.

CO3: Analyze the principles of transmission, suspension, steering and braking systems.

CO4: Study latest developments in automobiles.

CO – PO/PSO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	2	-	-	-	-	-	-	-	-	-	3	2	-
CO2	3	3	3	-	-	3	2	-	-	-	-	-	3	3	-
CO3	3	-	-	-	-	3	3	-	-	-	-	-	3	-	-
CO4	2	-	-	-	-	3	-	-	-	-	-	-	-	-	-
Avg	2.5	2.5	2.5	-	-	3	2.5	-	-	-	-	-	3	2.5	-

Course Name: TURBO MACHINERY

Course Code: ME 801B

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: Fluid Mechanics and Fluid machinery

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

1. Basic knowledge about rotary machines, nozzle, diffuser etc.
2. Understand about the calculation of efficiency, power etc. of steam turbines and hydraulic turbine.
3. Evaluate of efficiency, power required etc. of pumps and compressor
4. Design of various incompressible and compressible flow machines.

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
CO1	3	2	3	2	2	2	2	-	2	-	-	-	3	3	-
CO2	2	3	3	2	2	3	2	-	2	-	-	-	3	3	-
CO3	2	2	2	2	2	2	2	-	2	-	-	-	3	3	-
CO4	2	3	3	2	3	3	3	-	3	-	-	-	2	-	-
Avg.	2.25	2.5	2.75	2	2.25	2.5	2.25	-	2.25	-	-	-	2.75	2.25	-

Course Name : GAS DYNAMICS AND JET PROPULSION
Course Code : ME 801C
Contact : 3:0:0
Contact Hours: 36
CREDITS : 3

Prerequisite: Fluid Mechanics, Thermodynamics.

Course Outcomes: On successful completion of the course, the learner will be able to
ME 801C.1. Understand the basics of compressible flow.
ME 801C.2. Analyze compressible flow characteristics in constant and variable area ducts.
ME 801C.3. Apply the knowledge of shock theories in complex engineering situations.
ME801C.4. Evaluate jet and rocket propulsion techniques applicable in aerospace industries.

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
CO1	2	2	2	2	-	-	-	-	-	-	-	-	3	2	-
CO2	3	3	3	-	-	-	2	-	-	-	-	-	3	2	-
CO3	3	-	-	2	-	-	3	-	-	-	-	3	3	2	-
CO4	2	-	-	2	-	-	-	-	-	-	-	-	-	3	-
Avg	2.5	2.5	2.5	2	-	-	2.5	-	-	-	-	3	3	2.25	-

Course Name: 3D Printing & Design

Course Code: ME 802 A

Contact: 3:0:0

Contact Hours: 36

Credits: 3

Prerequisite: Computer Aided Design & Drafting Engineering Materials

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

CO1: Develop CAD models for 3D printing and Import and Export CAD data.

CO2: Select a specific material for the given application.

CO3: Select a 3D printing process for an application.

CO4: Produce a product using 3D Printing or Additive Manufacturing (AM).

CO – PO Mapping:

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

Course Name: Nanotechnology

Course Code: ME802B

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: Material science

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

CO 1: Identify 0D,1D,2D and 3D nanomaterials.

CO 2: Gain knowledge the optical and mechanical properties

CO 3: Interpret the magnetic and electrical properties.

CO 4: Illustrate the use of nanomaterials for different applications

CO – PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
CO1	1	2		3	1		1	2		2		
CO2	2	1	2			1	2	1	1	1		
CO3	2	3		2	1		3	2		2		
CO4	1		2			2		2		2		

Course Name: Industrial Instrumentation

Course Code: ME802C

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: Metrology and control system

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

CO1: Obtain knowledge about different instruments used to measure pressure, temperature, flow, level of liquids and data acquisition etc.

CO2: elucidate the construction and working of various industrial devices used to measure pressure, sound and flow

CO3: explicate the construction and working of various industrial devices used to measure temperature, level, vibration, viscosity and humidity

CO4: ability to analyze, formulate and select suitable sensor for the given industrial applications

CO – PO Mapping:

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

Course Name: Energy Conservation & Management

Course Code: ME802D

Contact: 3:0:0

Contact Hours: 36

Credit: 3

Prerequisite: Engineering Thermodynamics

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: Improve the thermal efficiency systems for heat recovery and co-generation using of energy management principles

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
CO1	3	3	3	-	-	-	-	-	-	-	-	-	-	-	3
CO2	-	-	-	3	-	-	-	-	-	-	-	-	-	3	3
CO3	2	2	-	2	-	-	-	-	-	-	-	-	-	2	3
CO4	-	-	3	-	-	-	-	-	-	-	-	-	-	-	3
Avg	2	2	3	2.5	-	-	-	-	-	-	-	-	-	2.5	3

Course Name: Artificial Intelligence**Course Code: ME 803 A****Contact: 3:0:0****Contact Hours: 36****Credit: 3****Prerequisite:** Strength of Material, Machine Design, Measurement and Instrumentation**Course Outcomes:** Upon successful completion of this course, students will be able to

1. Build intelligent agents for search and games.
2. Solve AI problems through programming with Python.
3. Learning optimization and inference algorithms for model learning.
4. Design and develop programs for an agent to learn and act in a structured environment.

CO – PO/PSO Mapping:

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

Course Name: Safety & Occupational Health**Course Code: ME 803 B****Contact: 3:0:0****Contact Hours: 36****Credit: 3****Prerequisite:** Strength of Material, Machine Design, Measurement and Instrumentation**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. Help students to understand the fundamentals of Safety Management like the scope and nature of occupational health and safety.
3. enables the student to apply safety and health related theory and technology to analyze workplaces to identify occupational hazards
4. 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
CO1	-	-	-	-	-	3	-	3	2	-	2	-	-	3	2
CO2	-	-	-	-	-	2	-	3	3	-	2	-	-	2	3
CO3	-	-	-	-	-	2	-	3	3	-	-	-	-	3	-
CO4	-	-	-	-	-	2	-	2	2	-	-	-	-	-	-
Avg	-	-	-	-	-	2.25	-	2.75	2.5	-	2	-	-	2	2.5

Course Name: Microprocessor Application in Automation**Course Code: ME 803C****Contact: 3:0:0****Contact Hours: 36****Credits: 3****Prerequisite:** knowledge of digital electronics, knowledge of 8085 microprocessor**Course Outcomes:**

CO1: Use data transfer techniques, describe architecture and operation of microcontroller 8051.

CO2: Develop assembly language programs using instruction set of 8051.

CO3: Design and develop microcontroller based systems.

CO4: Explain various applications of microcontrollers.

CO – PO/PSO Mapping:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PO 12
CO1	3	1	2	1	-	-	-	-	-	-	1	1
CO2	2	1	1	-	-	1	-	1	-	-	1	1
CO3	3	2	2	-	2	2	1	1	-	-	1	1
CO4	2	1	3	1	1	2	1	1	-	-	2	3

Course Name: Introduction to Electric Vehicles**Course Code: ME 803D****Contact: 3:0:0****Contact Hours: 36****Credits: 3****Prerequisite:** Knowledge of digital electronics, knowledge of 8085 microprocessor**Course Outcomes:**

CO1: An ability to design and develop environment friendly electric Vehicle

CO2: To introduce application of smart grid and electric vehicle for conversion, control and automation

CO3: To understand controlling strategies of electrical vehicles.

CO4: To design and model electric vehicle systems and analyze the energy management strategies.

CO – PO/PSO Mapping:

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

Paper Name: Essence of Indian Knowledge Tradition

Paper Code: MC801

Contact: 3:0:0

Contact Hours: 36

Non-Credit Mandatory Course

Course Outcomes:

At the end of the Course, Student will be able to:

CO 1: Identify the concept of Traditional knowledge and its importance.

CO 2: Explain the connection between Modern Science and Indian Knowledge System.

CO 3: Understand the importance of Yoga for health care.

CO 4: Interpret the effect of traditional knowledge on environment.

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

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