

MARTHANDAM COLLEGE OF ENGINEERING AND TECHNOLOGY**DEPARTMENT OF MECHANICAL ENGINEERING****Course Outcomes –2023-24 Odd Semester**

Sl. No.	Semester	Theory/ Practical	Course Code / Course Name
1.	3	Theory	MA3351 Transforms and Partial Differential Equations
2.	3	Theory	ME3351 Engineering Mechanics
3.	3	Theory	ME3391 Engineering Thermodynamics
4.	3	Theory	CE3391 Fluid Mechanics and Machinery
5.	3	Theory	ME3392 Engineering Materials and Metallurgy
6.	3	Theory	ME3393 Manufacturing Processes
7.	3	Practical	ME3381 Computer Aided Machine Drawing
8.	3	Practical	ME3382 Manufacturing Technology Laboratory
9.	3	Practical	GE3361 Professional Development
10.	5	Theory	ME 3592 Metrology and Measurement
11.	5	Theory	ME3591 Design of Machine Element
12.	5	Theory	CME365 Renewable Energy technologies
13.	5	Theory	MX3084Disaster Risk Reduction and Management
14.	5	Theory	CME350 Environment sustainability and Impact Assessment
15.	5	Theory	CME 360 Bioenergy Conversion Technologies
16.	5	Practical	ME3511 Metrology and Dynamics Laboratory
17.	5	Practical	ME3581 Metrology and Dynamics Laboratory
18.	7	Theory	ME 8792 Power Plant Engineering
19.	7	Theory	ME 8793 Process Planning and Cost Estimation
20.	7	Theory	ME 8791 Mechatronics
21.	7	Theory	OML 751Testing of Materials
22.	7	Theory	ME 8073 Unconventional Machining Processes
23.	7	Theory	ME 8099 Robotics
24.	7	Practical	ME8711 Simulation and Analysis Laboratory
25.	7	Practical	ME8781 Mechatronics Laboratory
26.	7	Practical	ME8712 Technical Seminar

Course Outcomes –2023-2024 EVEN Semester

Sl. No.	Semester	Theory/ Practical	Course Code / Course Name
1.	4	Theory	ME3491 Theory of Machines
2.	4	Theory	ME3451 Thermal Engineering
3.	4	Theory	ME3492 Hydraulics and Pneumatics
4.	4	Theory	ME3493 Manufacturing technology
5.	4	Theory	CE3491 Strength of Materials
6.	4	Theory	CE3481 Environmental sciences and Sustainability
7.	4	Practical	CE3481 Strength of Materials and Fluid Machinery Laboratory
8.	4	Practical	ME3461 Thermal Engineering Laboratory
9.	6	Theory	ME3691 Heat and Mass Transfer
10.	6	Theory	CME384 Power Plant Engineering
11.	6	Theory	CME387 Non-traditional Machining Process
12.	6	Theory	CME395 Casting and Welding Processes
13.	6	Theory	CME396Process Planning and Cost Estimation
14.	6	Theory	OCS352 IoT Concepts and Applications
15.	6	Theory	MX3089 Industrial Safety
16.	6	Practical	ME3681CAD/CAM Laboratory
17.	6	Practical	ME3682 Heat Transfer Laboratory
18.	8	Theory	MG8591 Principles of Management
19.	8	Theory	IE 8693 Production Planning and Control
20.	8	Practical	ME8811 Project Work

2023-2024 ODD Semester

III Semester B.E. MECH

MA3351 Transforms and Partial Differential Equations
COs Course Outcome : The students, after the completion of the course, are expected to
CO1- Understand how to solve the given standard partial differential equations.
CO2- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
CO3- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
CO4- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
CO5- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

ME3351 Engineering Mechanics
Course Outcome : At the end of the course students will have the
CO1- Illustrate the vector and scalar representation of forces and moments.
CO2- Analyse the rigid body in equilibrium.
CO3- Evaluate the properties of distributed forces.
CO4- Determine the friction and the effects by the laws of friction.
CO5- Calculate dynamic forces exerted in rigid body.

ME3391 Engineering Thermodynamics
COs Course Outcome : The students, after the completion of the course, are expected to
CO1- Apply the zeroth and first law of thermodynamics by formulating temperature scales and calculating the property changes in closed and open engineering systems.
CO2- Apply the second law of thermodynamics in analysing the performance of thermal devices through energy and entropy calculations.
CO3- Apply the second law of thermodynamics in evaluating the various properties of steam through steam tables and Mollier chart.
CO4- Apply the properties of pure substance in computing the macroscopic properties of ideal and real gases using gas laws and appropriate thermodynamic relations.
CO5- Apply the properties of gas mixtures in calculating the properties of gas mixtures and applying various thermodynamic relations to calculate property changes.

CE3391 Fluid Mechanics and Machinery
Course Outcome : The students, after the completion of the course, are having the
CO1- Understand the properties and behaviour in static conditions. Also, to understand the conservation laws applicable to fluids and its application through fluid kinematics and dynamics.
CO2- Estimate losses in pipelines for both laminar and turbulent conditions and analysis of pipes connected in series and parallel. Also, to understand the concept of boundary layer and its thickness on the flat solid surface.
CO3- Formulate the relationship among the parameters involved in the given fluid phenomenon and to predict the performances of prototype by model studies.
CO4- Explain the working principles of various turbines and design the various types of turbines.

CO5-Explain the working principles of centrifugal, reciprocating and rotary pumps and design the centrifugal and reciprocating pumps.

ME3392 Engineering Materials and Metallurgy

COs Course Outcome : The students, after the completion of the course, are expected to

CO1- Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.

CO2- Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.

CO3- Clarify the effect of alloying elements on ferrous and non-ferrous metals.

CO4- Summarize the properties and applications of non-metallic materials.

CO5- Explain the testing of mechanical properties.

ME3393 Manufacturing Processes

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

CO1- Explain the principle of different metal casting processes.

CO2- Describe the various metal joining processes.

CO3- Illustrate the different bulk deformation processes.

CO4- Apply the various sheet metal forming process.

CO5- Apply suitable moulding technique for manufacturing of plastics components.

Laboratory

ME3381 Computer Aided Machine Drawing

COs Course Outcome : The students, after the completion of the course, are expected the

CO1- Prepare standard drawing layout for modelled assemblies with BoM.

CO2- Model orthogonal views of machine components.

CO3- Prepare standard drawing layout for modelled parts.

ME3382 Manufacturing Technology Laboratory

Course Outcome : The students, after the completion of the course, are having the

CO1- Demonstrate the safety precautions exercised in the mechanical workshop and join two metals using GMAW.

CO2- The students able to make the work piece as per given shape and size using machining process such as rolling, drawing, turning, shaping, drilling and milling.

CO3- The students become make the gears using gear making machines and analyze the defects in the cast and machined components

GE3361 Professional Development

Course Outcome : The students, after the completion of the course, are having the

CO1- Use MS Word to create quality documents, by structuring and organizing content for their day to day technical and academic requirements.

CO2- Use MS EXCEL to perform data operations and analytics, record, retrieve data as per requirements and visualize data for ease of understanding.

CO3- Use MS PowerPoint to create high quality academic presentations by including common tables, charts, graphs, interlinking other elements, and using media objects.

ME 3592 Metrology and Measurement

COs Course Outcome : The students, after the completion of the course, are having the

CO1- Discuss the concepts of measurements to apply in various metrological instruments.

CO2- Apply the principle and applications of linear and angular measuring instruments, assembly and transmission elements.

CO3- Apply the tolerance symbols and tolerance analysis for industrial applications.

CO4- Apply the principles and methods of form and surface metrology.

CO5- Apply the advances in measurements for quality control in manufacturing Industries.

ME3591 Design of Machine Element

COs Course Outcome : The students, after the completion of the course, are expected to

CO1- Explain the design machine members subjected to static and variable loads.

CO2- Apply the concepts design to shafts, key and couplings.

CO3- Apply the concepts of design to bolted, Knuckle, Cotter, riveted and welded joints.

CO4- Apply the concept of design helical, leaf springs, flywheels, connecting rods and crank shafts.

CO5- Apply the concepts of design and select sliding and rolling contact bearings, seals and gaskets.

CME365 Renewable Energy technologies

COs Course Outcome : The students, after the completion of the course, are expected to

CO1- Discuss the Indian and global energy scenario.

CO2- Discuss Various solar energy technologies

CO3- Explain the various wind energy technologies.

CO4- Explore the various bio-energy technologies.

CO5- Discuss the ocean and geothermal technologies.

MX3084 Disaster Risk Reduction and Management

Course Outcome : The students, after the completion of the course, are expected to

CO1- To impart knowledge on the concepts of Disaster, Vulnerability and Disaster Risk reduction.

CO2- To enhance understanding on Hazards, Vulnerability and Disaster Risk Assessment prevention and risk reduction.

CO3- To develop disaster response skills by adopting relevant tools and technology.

CO4- Enhance awareness of institutional processes for Disaster response in the country.

CO5- Develop rudimentary ability to respond to their surroundings with potential Disaster response in areas where they live, with due sensitivity.

CME350 Environment sustainability and Impact Assessment

Course Outcome : The students, after the completion of the course, are expected to

CO1- To make the students to understand the concepts of Environmental Sustainability & Impact Assessment.

CO2- To familiarize the students in environmental decision making procedure.

CO3- Make the students to identify, predict and evaluate the economic, environmental, and social impact of development activities.

CO4- To provide information on the environmental consequences for decision making.

CO5- To promote environmentally sound and sustainable development through the identification of appropriate alternatives and mitigation measures.

CME 360 Bioenergy Conversion Technologies
Course Outcome : The students, after the completion of the course, are expected to
CO1-Estimate the surplus biomass availability of any given area.
CO2- Design a biogas plant for a variety of biofuels.
CO3- Determine and compare the cost of steam generation from biofuels with that of coal and petroleum fuels.
CO4- Analyse the influence of process governing parameters in thermochemical conversion of biomass.
CO5- Synthesize liquid biofuels for power generation from biomass.

Laboratory

ME3581 Metrology and Dynamics Laboratory
Course Outcome : The students, after the completion of the course, are expected to
CO1- The students able to measure the gear tooth dimensions, angle using sine bar, straightness
CO2- Determine mass moment of inertia of mechanical element, governor effort and range of sensitivity.
CO3- Determine the natural frequency and damping coefficient, critical speeds of shafts,

VII Semester B.E. MECH

ME8792 POWER PLANT ENGINEERING
COs Course Outcome : Upon the completion of this course the students will be able to
CO1 Explain the layout, construction and working of the components inside a thermal power plant.
CO2 Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.
CO3 Explain the layout, construction and working of the components inside nuclear power plants.
CO4 Explain the layout, construction and working of the components inside Renewable energy power plants.
CO5 Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

ME8793 PROCESS PLANNING AND COST ESTIMATION
COs Course Outcome : Upon the completion of this course the students will be able to

CO1 select the process, equipment and tools for various industrial products.
CO2 prepare process planning activity chart.
CO3 explain the concept of cost estimation.
CO4 compute the job order cost for different type of shop floor.
CO5 calculate the machining time for various machining operations

ME8791 MECHATRONICS

Course Outcome : Upon the completion of this course the students will be able to
CO1 Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical, Electronic Systems and sensor technology.
CO2 Discuss the architecture of Microprocessor and Microcontroller, Pin Diagram, Addressing Modes of Microprocessor and Microcontroller.
CO3 Discuss Programmable Peripheral Interface, Architecture of 8255 PPI, and various device interfacing
CO4 Explain the architecture, programming and application of programmable logic controllers to problems and challenges in the areas of Mechatronic engineering.
CO5 Discuss various Actuators and Mechatronics system using the knowledge and skills acquired through the course and also from the given case studies.

OML751 Testing of Materials

Course Outcome : The students, after the completion of the course, are expected to
CO1 Understand different types of material testing methods.
CO2 Identify suitable Mechanical testing technique to inspect industrial component.
CO3 Ability to use the different technique of NDT and know its applications.
CO4 Ability to use material characterization technique
CO5 Ability to use thermal and chemical testing on materials.

ME8073 Unconventional Machining Processes

COs Course Outcome : The students, after the completion of the course, are having the
CO1. Explain the need for unconventional machining processes and its classification
CO2. Compare various thermal energy and electrical energy based unconventional machining processes.
CO3. Summarize various chemical and electro-chemical energy based unconventional machining processes.
CO4. Explain various nano abrasives based unconventional machining processes.
CO5. Distinguish various recent trends based unconventional machining processes.

ME8099 Robotics

Course Outcome : The students, after the completion of the course, are expected to
CO1 Explain the concepts of industrial robots, classification, specifications and coordinate systems. Also summarize the need and application of robots in different sectors. analysis of robots.
CO2 Illustrate the different types of robot drive systems as well as robot end effectors.
CO3 Apply the different sensors and image processing techniques in robotics to improve the ability of robots.
CO4 Develop robotic programs for different tasks and familiarize with the kinematics motions of robot.
CO5 Examine the implementation of robots in various industrial sectors and interpolate the economic

Laboratory

ME8711 SIMULATION AND ANALYSIS LABORATORY
Course Outcome : Upon the completion of this course the students will be able to
CO1 simulate the working principle of air conditioning system, hydraulic and pneumatic cylinder and cam follower mechanisms using MATLAB.
CO2 analyze the stresses and strains induced in plates, brackets and beams and heat transfer problems.
CO3 calculate the natural frequency and mode shape analysis of 2D components and beams

ME8781 MECHATRONICS LABORATORY
COs Course Outcome : Upon the completion of this course the students will be able to
CO1 Demonstrate the functioning of mechatronics system with various pneumatic, hydraulic and electrical systems.
CO2 Demonstrate the functioning of control systems with the help of PLC and microcontrollers.

ME8712 TECHNICAL SEMINAR
To enrich the communication skills of the student and presentations of technical topics of interest, this course is introduced. In this course, a student has to present three Technical papers or recent advances in engineering/technology that will be evaluated by a Committee constituted by the Head of the Department.

2023-2024 EVEN Semester

IV Semester – B.E. MECH

ME3491 Theory of Machines

Course Outcome : Upon successful completion of the course, students should be able to:

CO1- Discuss the basics of mechanism

CO2- Solve problems on gears and gear trains.

CO3- Examine friction in machine elements.

CO4- Calculate static and dynamic forces of mechanisms.

CO5- Calculate the balancing masses and their locations of reciprocating and rotating masses. Computing the frequency of free vibration, forced vibration and damping coefficient.

ME3451 Thermal Engineering

Course Outcome : The students, after the completion of the course, are expected to

CO1- Apply thermodynamic concepts to different air standard cycles and solve problems.

CO2- To solve problems in steam nozzle and calculate critical pressure ratio.

CO3- Explain the flow in steam turbines, draw velocity diagrams, flow in Gas turbines and solve problems.

CO4- Explain the functioning and features of IC engine, components and auxiliaries.

CO5- Calculate the various performance parameters of IC engines

ME3492 Hydraulics and Pneumatics

COs Course Outcome : The students, after the completion of the course, are expected to

CO1- Apply the working principles of fluid power systems and hydraulic pumps.

CO2- To understand the concepts of Lines and Insulators.

CO3- Design and develop hydraulic circuits and systems.

CO4- Apply the working principles of pneumatic circuits and power system and its components.

CO5- Identify Various trouble shooting methods in fluid power system.

ME3493 Manufacturing technology

COs Course Outcome : The students, after the completion of the course, are expected

CO1- Apply the mechanism of metal removal process and to identify the factors involved in improving machinability.

CO2- Describe the constructional and operational features of centre lathe and other special purpose lathes.

CO3- Describe the constructional and operational features of reciprocating machine tools.

CO4- Apply the constructional features and working principles of CNC machine tools.

CO5- Demonstrate the Program CNC machine tools through planning, writing codes and setting up CNC machine tools to manufacture a given component.

CE3491 Strength of Materials

Course Outcome : The students, after the completion of the course, are expected to get the

CO1- Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
CO2- Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
CO3- Apply basic equation of torsion in designing of shafts and helical springs
CO4- Calculate slope and deflection in beams using different methods.
CO5- Analyze thin and thick shells for applied pressures.

CE3481 Environmental sciences and Sustainability
COs Course Outcome : The students, after the completion of the course, are expected to
CO1- To recognize and understand the functions of environment, ecosystems and biodiversity and their conservation.
CO2- To identify the causes, effects of environmental pollution and natural disasters and contribute to the preventive measures in the society.
CO3- To identify and apply the understanding of renewable and non-renewable resources and contribute to the sustainable measures to preserve them for future generations.
CO4- To recognize the different goals of sustainable development and apply them for suitable technological advancement and societal development.
CO5- To demonstrate the knowledge of sustainability practices and identify green materials, energy cycles and the role of sustainable urbanization.

Laboratory

CE3481 Strength of Materials and Fluid Machinery Laboratory
COs Course Outcome : The students, after the completion of the course, are expected to
CO1- Determine the tensile, torsion and hardness properties of metals by testing.
CO2- Determine the stiffness properties of helical and carriage spring.
CO3- Apply the conservation laws to determine the coefficient of discharge of a venturimeter and finding the friction factor of given pipe.
CO4- Apply the fluid static and momentum principles to determine the metacentric height and forces due to impact of jet.
CO5- Determine the performance characteristics of turbine, rotodynamic pump and positive displacement pump.

ME3461 Thermal Engineering Laboratory
COs Course Outcome :At the end of the course, the student should have the :
CO1- Conduct tests to evaluate performance characteristics of IC engines
CO2- Conduct tests to evaluate the performance of refrigeration cycle
CO3- Conduct tests to evaluate Performance and Energy Balance on a Steam Generator.

ME3691 Heat and Mass Transfer

COs Course Outcome : The students, after the completion of the course, are expected to

CO1- Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems.

CO2- Apply free and forced convective heat transfer correlations to internal and external flows through/over various surface configurations and solve problems.

CO3- Explain the phenomena of boiling and condensation, apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems.

CO4- Explain basic laws for Radiation and apply these principles to radiative heat transfer between different types of surfaces to solve problems.

CO5- Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications.

CME384 Power Plant Engineering

COs Course Outcome : The students, after the completion of the course, are having the

CO1- Explain the layout, construction and working of the components inside a thermal power plant.

CO2 - Explain the layout, construction and working of the components inside a Diesel, Gas and Combined cycle power plants.

CO3 - Explain the layout, construction and working of the components inside nuclear power plants.

CO4 - Explain the layout, construction and working of the components inside Renewable energy power plants

CO5 - Explain the applications of power plants while extend their knowledge to power plant economics and environmental hazards and estimate the costs of electrical energy production.

CME387 Non-traditional Machining Process

Course Outcome : The students, after the completion of the course, have the

CO1- Formulate different types of non-traditional machining processes and evaluate mechanical energy based non-traditional machining processes.

CO2- Illustrate chemical and electro chemical energy based processes.

CO3- Evaluate thermo-electric energy based processes.

CO4- Interpret nano finishing processes.

CO5- Analyse hybrid non-traditional machining processes and differentiate non- traditional machining processes.

CME395 Casting and Welding Processes

Course Outcome : The students, after the completion of the course, are expected to

CO1- Explain the ferrous casting metallurgy and its applications.

CO2- Explain the non ferrous casting metallurgy and its applications.

CO3- Explain the ferrous welding metallurgy and its applications.

CO4- Explain the welding metallurgy of alloy steels and non ferrous metals and its applications.

CO5- Identify the causes and remedies of various welding defects; apply welding standards and codes.

CME396 Process Planning and Cost Estimation

Course Outcome : The students, after the completion of the course, are having the

CO1- Discuss select the process, equipment and tools for various industrial products.

CO2- Explain the prepare process planning activity chart.
CO3- Explain the concept of cost estimation.
CO4- Compute the job order cost for different type of shop floor.
CO5- Calculate the machining time for various machining operations.

OCS352 IoT Concepts and Applications
COs Course Outcome : The students, after the completion of the course, are having the
CO1- Explain the concept of IoT.
CO2- Understand the communication models and various protocols for IoT.
CO3- Design portable IoT using Arduino/Raspberry Pi /open platform
CO4- Apply data analytics and use cloud offerings related to IoT.
CO5- Analyze applications of IoT in real time scenario

MX3089 Industrial Safety
COs Course Outcome : The students, after the completion of the course, are expected to
CO1- Understand the basic concept of safety.
CO2- Obtain knowledge of Statutory Regulations and standards.
CO3- Know about the safety Activities of the Working Place.
CO4- Analyze on the impact of Occupational Exposures and their Remedies
CO5-Obtain knowledge of Risk Assessment Techniques.

Laboratory

ME3682 Heat Transfer Laboratory
COs Course Outcome : The students, after the completion of the course, are expected to
CO1- Conduct experiment on Predict the thermal conductivity of solids and liquids
CO2- Conduct experiment on Estimate the heat transfer coefficient values of various fluids.
CO3- Conduct experiment on Test the performance of tubes in tube heat exchangers

VIII Semester B.E. MECH

MG8591 PRINCIPLES OF MANAGEMENT
Course Outcome : Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

IE 8693 Production Planning and Control
Course Outcome : At the end of the course students will have the
CO1 Upon completion of this course, the students can able to prepare production planningand control activities such as work study, product planning, production scheduling, InventoryControl.
CO2 They can plan manufacturing requirements manufacturing requirement Planning (MRP II) and Enterprise Resource Planning (ERP)

CO3- Conduct experiment on Test the performance of tubes in tube heat exchangers

Laboratory

ME8811 PROJECT WORK

COs Course Outcome : On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.