MARTHANDAM COLLEGE OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

Course Outcomes –2022-23Odd 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	ME8595 Thermal Engineering- II
11.	5	Theory	ME8593 Design of Machine Elements
12.	5	Theory	ME8501 Metrology and Measurements
13.	5	Theory	ME8594 Dynamics of Machines
14.	5	Theory	ORO 551 Renewable Energy Systems
15.	5	Theory	ME8511 Kinematics and Dynamics Laboratory
16.	5	Practical	ME8512 Thermal Engineering Laboratory
17.	5	Practical	ME8513 Metrology and Measurements 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 –2022-23EVEN 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	ME8651Design of Transmission Systems
10.	6	Theory	ME8691 Computer Aided Design and Manufacturing
11.	6	Theory	ME8693 Heat and Mass Transfer
12.	6	Theory	ME8692 Finite Element Analysis
13.	6	Theory	ME8694 Hydraulics and Pneumatics
14.	6	Theory	ME 8091 Automobile Engineering
15.	6	Practical	ME8681 CAD / CAM Laboratory
16.	6	Practical	ME8682 Design and Fabrication Project
17.	6	Practical	HS8581 Professional Communication
18.	8	Theory	MG8591 Principles of Management
19.	8	Theory	IE 8693 Production Planning and Control
20.	8	Practical	ME8811 Project Work

2022-2023 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.
Solve CO2- Solve differential equations using Fourier series analysis which plays a vital role i 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 woul 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 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 an real gases using gas laws and appropriate thermodynamic relations.
CO5- Apply the properties of gas mixtures in calculating the properties of gas mixtures and applyin 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 y
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 proce 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 th cast and machined components

V Semester B.E. MECH

ME8595 THERMAL ENGINEERING – II
COs Course Outcome : Upon the completion of this course the students will be able to
CO1 Solve problems in Steam Nozzle
CO2 Explain the functioning and features of different types of Boilers and auxiliaries and calculate performance parameters.
CO3 Explain the flow in steam turbines, draw velocity diagrams for steam turbines and solv problems.
CO4 Summarize the concept of Cogeneration, Working features of Heat pumps and Heat exchangers
CO5 Solve problems using refrigerant table / charts and psychrometric charts

ME8593 DESIGN OF MACHINE ELEMENTS
COs Course Outcome : Upon the completion of this course the students will be able to
CO1 Explain the influence of steady and variable stresses in machine component design.
CO2 Apply the concepts of design to shafts, keys and couplings.
CO3 Apply the concepts of design to temporary and permanent joints.
CO4 Apply the concepts of design to energy absorbing members, connecting rod and crank shaft.
CO5 Apply the concepts of design to bearings.

ME8501 METROLOGY AND MEASUREMENTS
COs Course Outcome : Upon the completion of this course the students will be able to
CO1 Describe the concepts of measurements to apply in various metrological instruments
CO2 Outline the principles of linear and angular measurement tools used for industrial applications
CO3 Explain the procedure for conducting computer aided inspection.
CO4 Demonstrate the techniques of form measurement used for industrial components
CO5 Discuss various measuring techniques of mechanical properties in industrial Applications.

ME8594 DYNAMICS OF MACHINES
Course Outcome : Upon the completion of this course the students will be able to
CO1 Calculate static and dynamic forces of mechanisms.
CO2 Calculate the balancing masses and their locations of reciprocating and rotating masse
CO3 Compute the frequency of free vibration.
CO4 Compute the frequency of forced vibration and damping coefficient.
CO5 Calculate the speed and lift of the governor and estimate the gyroscopic effect on automobiles, ships and airplanes.

ORO 551 Renewable Energy Systems
Course Outcome : The students, after the completion of the course, are expected to
CO1-Understanding the physics of solar radiation.
CO2- Ability to classify the solar energy collectors and methodologies of storing solar energy
CO3- Knowledge in applying solar energy in a useful way.
CO4- Knowledge in wind energy and biomass with its economic aspects.
CO5- Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies

Laboratory

ME8511 KINEMATICS AND DYNAMICS LABORATORY
Course Outcome : Upon the completion of this course the students will be able to
CO1 Explain gear parameters, kinematics of mechanisms, gyroscopic effect and working of lab equipments.
CO2 Determine mass moment of inertia of mechanical element, governor effort and range sensitivity, natural frequency and damping coefficient, torsional frequency, critical speeds shafts, balancing mass of rotating and reciprocating masses, and transmissibility ratio.

ME8512 THERMAL ENGINEERING LABORATORY
COs Course Outcome : Upon the completion of this course the students will be able to
CO1 conduct tests on heat conduction apparatus and evaluate thermal conductivity of materials.
CO2 conduct tests on natural and forced convective heat transfer apparatus and evaluate heat transfer coefficient.
CO3 conduct tests on radiative heat transfer apparatus and evaluate Stefan Boltzmann constant and emissivity.
CO4 conduct tests to evaluate the performance of parallel/counter flow heat exchanger apparatus and reciprocating air compressor.
CO5 conduct tests to evaluate the performance of refrigeration and airconditioning test rigs

ME8513 METROLOGY AND MEASUREMENTS LABORATORY
Course Outcome : Upon the completion of this course the students will be able to
CO1 Measure the gear tooth dimensions, angle using sine bar, straightness and flatness, thread parameters, temperature using thermocouple, force, displacement, torque and vibration.
CO2 Calibrate the vernier, micrometer and slip gauges and setting up the comparator for the inspection

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 powe 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 coordinat 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 th ability of robots.
CO4 Develop robotic programs for different tasks and familiarize with the kinematic 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 transferproblems.
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, hydrauli and electrical systems.
CO2 Demonstrate the functioning of control systems with the help of PLC an microcontrollers.
COs Course Outcome : Upon the completion of this course the students will be able to

ME8712 TECHNICALSEMINAR
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.

2022 – 2023 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- TounderstandtheconceptsofLinesandInsulators.
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 i improving machinability.
CO2- Describe the constructional and operational features of centre lathe and other special purpos 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 u 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 got 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 shearir 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.

VI Semester B.E. MECH

ME8651 DESIGN OF TRANSMISSION SYSTEMS
COs Course Outcome : Upon the completion of this course the students will be able to
CO1 apply the concepts of design to belts, chains and rope drives.
CO2 apply the concepts of design to spur, helical gears.
CO3 apply the concepts of design to worm and bevel gears.
CO4 apply the concepts of design to gear boxes .
CO5 apply the concepts of design to cams, brakes and clutches.

ME8691 COMPUTER AIDED DESIGN AND MANUFACTURING
COs Course Outcome : Upon the completion of this course the students will be able to
CO1 Explain the 2D and 3D transformations, clipping algorithm, Manufacturing models and Metrics
CO2 Explain the fundamentals of parametric curves, surfaces and Solids
CO3 Summarize the different types of Standard systems used in CAD
CO4 Apply NC & CNC programming concepts to develop part programme for Lathe & Milling Machines
CO5 Summarize the different types of techniques used in Cellular Manufacturing and FMS

ME8693 HEAT AND MASS TRANSFER
Course Outcome : Upon the completion of this course the students will be able 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

ME8692 FINITE ELEMENT ANALYSIS
Course Outcome :
CO1 Summarize the basics of finite element formulation.
CO2 Apply finite element formulations to solve one dimensional Problems.
CO3 Apply finite element formulations to solve two dimensional scalar Problems.
CO4 Apply finite element method to solve two dimensional Vector problems.
CO5 Apply finite element method to solve problems on iso parametric element and dynamic Problems.

ME8694 HYDRAULICS AND PNEUMATICS
Course Outcome : Upon the completion of this course the students will be able to
CO1 Explain the Fluid power and operation of different types of pumps.
CO2 Summarize the features and functions of Hydraulic motors, actuators and Flow contr valves
CO3 Explain the different types of Hydraulic circuits and systems
CO4 Explain the working of different pneumatic circuits and systems
CO5 Summarize the various trouble shooting methods and applications of hydraulic and pneumatic systems.

Laboratory

ME8681 CAD / CAM LABORATORY
COs Course Outcome :
CO1 Draw 3D and Assembly drawing using CAD software
CO2 Demonstrate manual part programming with G and M codes using CAM

ME8682 DESIGN AND FABRICATION PROJECT
COs Course Outcome : Upon the completion of this course the students will be able to
CO1 design and Fabricate the machine element or the mechanical product.
CO2 demonstrate the working model of the machine element or the mechanical product.

HS8581 PROFESSIONAL COMMUNICATION
Course Outcome : At the end of the course Learners will be able to:
CO1 Make effective presentations
CO2 Participate confidently in Group Discussions.
CO3 Attend job interviews and be successful in them.
CO4 Develop adequate Soft Skills required for the workplace

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 productio planningand control activities such as work study, product planning, production schedulin InventoryControl.
CO2 They can plan manufacturing requirements manufacturing requirement Plannin

(MRP II) and Enterprise Resource Planning (ERP)

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.