ANNA UNIVERSITY CHENNAI

KATHIR COLLEGE OF ENGINEERING, COIMBATORE

DEPARTMENT OF MECHANICAL ENGINEERING

R2017 REGULATION

PROGRAMME OUTCOMES (POs)

Students graduating from Mechanical Engineering should be 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: Identity, 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 writeeffective 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 self, and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOME (PSOs)

PSO1: Understand the requirements and play their professional role to solve real-world problems in the mechanical engineering domains such as manufacturing, design, thermal, fluid power and materials engineering.

PSO2: Work in teams to create products by integrating multidisciplinary modules.

PSO3 : Foresee the future needs of society and prepare for his professional role.

COURSE OUTCOMES

I - SEMESTER	
Course code	**C101**
Subject code	**HS8151**
Subject name	**Communicative English**
COURSE OUTCOMES	
CO1	Speak clearly, confidently, comprehensibly, and communicate with one or many listeners using appropriate communicative strategies.
CO2	Write cohesively and coherently and flawlessly avoiding grammatical errors, using a wide vocabulary range, organizing their ideas logically on a topic.
CO3	Read different genres of texts adopting various reading strategies.
CO4	Listen/view and comprehend different spoken discourses/excepts in different accents.
CO5	Gaining capacity, skills enabling the students to write personal letters, official letters and E-mails in English effectively. Enabling students to enhance their conversational skills in spoken and written forms.

Course code	C102
Subject code	MA8151
Subject name	**Engineering Mathematics – I**
COURSE OUTCOMES	
CO1	Have basic knowledge and understanding in one field of materials, integral and differential calculus.
CO2	Utilize methods of integration to compute volumes of objects with circularshaped aspects, and compute lengths of curves.
CO3	Read and understand problem descriptions, then be able to formulate equations modelling the problem usually by applying geometric or physical principles.
CO4	Use integration to compute problems important in physics and engineering.
CO5	Find the area of plane curves and volume of solids using double and triple integrals.

Course code	C103
Subject code	PH8151
Subject name	**Engineering Physics**
COURSE OUTCOMES	
CO1	Have knowledge on the basics of physics related to properties of matter, optics, and acoustics.
CO2	Apply these fundamental principles to solve practical problems related to materials used for engineering applications.
CO3	Understand working principle of a LASER, components and working of different laser system and their engineering applications
CO4	Understand the principle and working of particle detectors
CO5	Examine the characteristics of laser and optical fiber.

Course code	C104
Subject code	CY8151
Subject name	**Engineering Chemistry**
COURSE OUTCOMES	
CO1	Apply this knowledge to the analysis and design of batteries.
CO2	Phase rule concept is used to know the heat treatment process of alloy.
CO3	Know the properties of Lubricants.
CO4	The knowledge gained on polymer chemistry, thermodynamics, Spectroscopy, phase rule and nano materials will provide a strong platform to understand the concepts on these subjects for further learning.
CO5	Outline the synthesis, characteristics and the applications of nano

	materials.

Course code	C105
Subject code	GE8151
Subject name	**Problem Solving and Python Programming**
COURSE OUTCOMES	
CO1	Develop algorithmic solutions to simple computational problems.
CO2	Read, write, execute by hand simple Python programs.
CO3	Structure simple Python programs for solving problems.
CO4	Decompose a Python program into functions.
CO5	Represent compound data using Python lists, tuples, dictionaries. Read and write data from/to files in Python Programs.

Course code	C106
Subject code	GE8152
Subject name	**ENGINEERING GRAPHICS**
COURSE OUTCOMES	
CO1	Perform free hand sketching of basic geometrical constructions and multiple views of objects.
CO2	Do orthographic projection of lines and plane surfaces.
CO3	Draw projections and solids and development of surfaces.
CO4	Prepare isometric and perspective sections of simple solids.
CO5	Demonstrate computer aided drafting.

Course code	C107
Subject code	GE8161
Subject name	**Problem Solving and Python Programming Laboratory**
COURSE OUTCOMES	
CO1	Write, test, and debug simple Python programs.
CO2	Implement Python programs with conditionals and loops.
CO3	Develop Python programs step-wise by defining functions and calling them.
CO4	Use Python lists, tuples, dictionaries for representing compound data.
CO5	Read and write data from/to files in Python.

Course code	C108
Subject code	BS8161
Subject name	**Physics and Chemistry Laboratory**
COURSE OUTCOMES	
CO1	Apply physics principles of optics and thermal physics to evaluate engineering properties of materials.
CO2	Outfit with hands-on knowledge in the quantitative chemical analysis of water quality related parameters
CO3	Determine the DO content in water sample by winkler's method and molecular weight of polymer by Ostwald viscometer.
CO4	Find the strength of an acid using pH meter and conductometer
CO5	Estimate the amount of weak and strong acids in a mixture by conductometer

II - SEMESTER	

Course code	C109
Subject code	HS8251
Subject name	**Technical English**
COURSE OUTCOMES	
CO1	Speak convincingly, express their opinions clearly, initiate a discussion, negotiate, and argue using appropriate communicative strategies.
CO2	Write effectively and persuasively and produce different types of writing such as narration, description, exposition and argument as well as creative, critical, analytical and evaluative writing.
CO3	Read different genres of texts, infer implied meanings and critically analyse and evaluate them for ideas as well as for method of presentation.
CO4	Listen/view and comprehend different spoken excerpts critically and infer unspoken and implied meanings.
CO5	Enhancing student's skills in report writing, job application, paragraph writing and other forms of writing skills.

Course code	C110
Subject code	MA8251
Subject name	Engineering Mathematics – II
COURSE OUTCOMES	
CO1	Develop the fundamentals and basic concepts in vector calculus, ODE, Laplace transform and complex functions.
CO2	Solve problems related to engineering applications by using these techniques.
CO3	To have an ability of mathematical modelling of systems using differential equations and ability to solve the differential equations.
CO4	Use Green's theorem to evaluate line integrals along simple closed contours on the plane and use Stokes' theorem to give a physical interpretation of the curl of a vector field.
CO5	Expand functions of two variables as Taylor's and Laurent's series and evaluate Contour integrals using Cauchy's formula.

Course code	C111
Subject code	PH8251
Subject name	Materials Science
COURSE OUTCOMES	
CO1	The students will have knowledge on the various phase diagrams and their applications
CO2	The students will acquire knowledge on Fe-Fe3C phase diagram,various microstructures and alloys
CO3	The students will get knowledge on mechanical properties of materials and their measurement
CO4	The students will gain knowledge on magnetic, dielectric and superconducting properties of materials
CO5	The students will understand the basics of ceramics, composites and nano materials

Course code	C112
Subject code	BE8253
Subject name	Basic Electrical, Electronics and Engineering

COURSE OUTCOMES	
CO1	Understand electric circuits and working principles of electrical machines
CO2	Understand the concepts of various electronic devices
CO3	Choose appropriate instruments for electrical measurement for a specific application
CO4	Clarify the working of basic electronic devices such as diode, transistor and rectifier.
CO5	Demonstrate operation of digital devices such as logic gates, counters, flip-flops analog to digital converts and digital to analog converters.

Course code	C113
Subject code	GE8291
Subject name	Environmental Science and Engineering

COURSE OUTCOMES	
CO1	Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
CO2	Public awareness of environmental is at infant stage.
CO3	Ignorance and incomplete knowledge has lead to misconceptions
CO4	Development and improvement in std. of living has lead to serious environmental disasters.
CO5	Explain the causes of population growth and explosion.

Course code	C114
Subject code	GE8292
Subject name	Engineering Mechanics

COURSE OUTCOMES	
CO1	Illustrate the vectorial and scalar representation of forces and moments
CO2	Analyse the rigid body in equilibrium
CO3	Evaluate the properties of surfaces and solids
CO4	Calculate dynamic forces exerted in rigid body
CO5	Determine the friction and the effects by the laws of friction

Course code	C115
Subject code	GE8261
Subject name	**Engineering Practices Laboratory**

COURSE OUTCOMES	
CO1	Fabricate carpentry components and pipe connections including plumbing works.
CO2	Use welding equipments to join the structures.
CO3	Carry out the basic machining operations.
CO4	Make the models using sheet metal works. Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings.
CO5	Carry out basic home electrical works and appliances. Measure the electrical quantities. Elaborate on the components, gates, soldering practices.

Course code	C116
Subject code	BE8261
Subject name	**Basic Electrical, Electronics and Instrumentation Engineering**

COURSE OUTCOMES	
CO1	Ability to determine the speed characteristic of different electrical machines
CO2	Ability to design simple circuits involving diodes and transistors
CO3	Ability to use operational amplifiers
CO4	Demonstrate operation of digital devices such as logic gates, counters, flip-flops analog to digital converts and digital to analog converters.
CO5	Justify the knowledge on working of communication systems such as radio, radar, fax and television.

III - SEMESTER

Course code	C201
Subject code	MA 8353
Subject name	**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**

COURSE OUTCOMES	
CO1	Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
CO2	Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
CO3	To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems
CO4	Appreciate the physical significance of Fourier series techniques in

	solving one and two dimensional heat flow problems and one dimensional wave equations.
CO5	To understand the mathematical principles on transform and partial differential equations would provide them the ability to formulate

Course code	C202
Subject code	ME8391
Subject name	**Engineering Thermodynamics**
COURSE OUTCOMES	
CO1	To familiarize the students to understand the fundamentals of thermodynamics and First law of thermodynamics along with its application to closed and open systems.
CO2	To familiarize the students to understand the second law of thermodynamics and its corollaries, principle of increase in entropy, Available and non-available energy along with irreversibility. I and II law Efficiency.
CO3	Discuss about properties of pure substance and steam power cycle
CO4	Differentiate between ideal and real gases and interpret thermodynamic cycles
CO5	Solve problem using the properties of gas mixture and the psychometric properties.

Course code	C203
Subject code	CE8394
Subject name	**Fluid Mechanics and Machinery**
COURSE OUTCOMES	
CO1	To understand the basics concepts of fluid properties and their applications.
CO2	CO2: Analyze the types of friction flow through the circular conduits and its applications.
CO3	CO3: To calculate the dimensional analysis for given variables and analyze on models using dimensionless parameters.
CO4	CO4: To compare the working principles of centrifugal ,reciprocating and rotary pumps
CO5	CO5: To classify the turbines based on heads / efficiencies and compare their performances.

Course code	C204
Subject code	ME 8351
Subject name	**Manufacturing Technology I**

COURSE OUTCOMES	
CO1	Explain different metal casting processes, associated defects, merits and demerits
CO2	Compare different metal joining processes.
CO3	Summarize various hot working and cold working methods of metals.
CO4	Explain various sheet metal making processes.
CO5	Distinguish various methods of manufacturing plastic components.

Course code	C205
Subject code	EE 8353
Subject name	**Electric Drives and Controls**

COURSE OUTCOMES	
CO1	To know the basic concept of Electrical Drive.
CO2	Analysis the different characteristics of the electrical drives motor.
CO3	To gather the types of DC motor starters
CO4	To know about the conventional and solid state speed control of DC. Drives.
CO5	To get a thoughts about conventional and solid state speed control of AC drives.

Course code	C206
Subject code	ME8361
Subject name	**Manufacturing Technology I Laboratory**

COURSE OUTCOMES	
CO1	Demonstrate the safety precautions exercised in the mechanical workshop.
CO2	Make the workpiece as per given shape and size using Lathe.
CO3	Join two metals using arc welding.
CO4	Use sheet metal fabrication tools and make simple tray and funnel.
CO5	Use different moulding tools, patterns and prepare sand moulds.

Course code	C207
Subject code	ME8381
Subject name	**Computer Aided Machine Drawing**
COURSE OUTCOMES	
CO1	Follow the drawing standards, Fits and Tolerances
CO2	Re-create part drawings, sectional views and assembly drawings as per standards
CO3	Apply modern tools in design, manufacture and planning
CO4	Exhibit ethical principles in engineering practices
CO5	Perform task as an individual and / or team member to manage the task in time

Course code	C208
Subject code	EE8361
Subject name	**Electrical Engineering Laboratory**
COURSE OUTCOMES	
CO1	Knowledge on performance of DC Shunt and Series Motor and on speed control behaviour of DC Shunt Motor.
CO2	Knowledge on the Characteristics of DC Shunt generator on O.C and Load conditions.
CO3	Knowledge on the performance of Single Phase Transformer.
CO4	Knowledge on performance of Synchronous machine.
CO5	Knowledge on performance and speed control behaviour of an induction motor.

IV - SEMESTER	

Course code	C209
Subject code	MA6452
Subject name	**Statistics and Numerical Methods**
COURSE OUTCOMES	
CO1	Solve large sample problems by applying the concepts of hypotheisistetsing based on normal, t, chi square and F distribution.
CO2	Design experiments, carry them out and analyze the data they yield
CO3	Gain understanding of linear and nonlinear (algebraic or transcendental) equations, numerically compute Eigen values of a matrix
CO4	Apply numerical techniques of differentiation and integration for engineering problems.
CO5	Solve first and second order differential equations using various numerical techniques

Course code	C210
Subject code	ME6401
Subject name	**Kinematics of Machinery**

COURSE OUTCOMES	
CO1	Understand the elementary concepts of links, joints, chains and pairs and apply the concepts to find the inversions of kinematic chains to identify different types of mechanisms in common applications
CO2	Calculate different components of velocity and acceleration of links in simple mechanisms using graphical methods
CO3	Manually construct different cam profiles in accordance with required predefined follower motions
CO4	Apply the concepts of toothed gearing to design possible gear trains and determine speed of simple, compound and Epicyclic gear trains
CO5	Calculate the forces and torques involved in friction drives like screw threads, clutches, belts, ropes, and band and block brakes.

Course code	C211
Subject code	ME6402
Subject name	**Manufacturing Technology II**

COURSE OUTCOMES	
CO1	Describe the functions and applications of different metal cutting tools, calculate the forces involved in orthogonal metal cutting, estimate tool wear and tool life
CO2	Interpret the constructional features of different lathe machines, estimate the power consumption and machining time for different machining processes
CO3	Demonstrate the construction & working of shaping, milling & drilling machines and select the machining processes required for production of a desired component.
CO4	Illustrate different types of grinding and broaching machines and demonstrate their working
CO5	Explain the constructional features and working of different types of CNC machines, write codes to manufacture components using CNC machines

Course code	C212
Subject code	ME6403
Subject name	**Engineering Materials and Metallurgy**

COURSE OUTCOMES	
CO1	Interpret the phase diagram for multicomponent systems and explain various microstructures of steel and cast iron.
CO2	Illustrate various types of heat treatment processes and sketch isothermal transformation curves
CO3	Classify and compare the composition of different ferrous as well as nonferrous alloys
CO4	Describe the properties of different polymers and composite materials and identify their area of applications
CO5	Explain the process of plastic deformation, identify the types of fractures and illustrate various mechanical testing methods for ferrous and non-ferrous alloys

Course code	C213
Subject code	GE6351
Subject name	**Environmental Science and Engineering**

COURSE OUTCOMES	
CO1	Classify various types of ecosystems and energy flow within the ecosystem, describe the concept of biodiversity and list the types of threats to biodiversity in India
CO2	Explain the factors responsible for air and water pollution, identify the technological and economical solutions to take care of such problems.
CO3	Illustrate the different types of natural resources and list the factors responsible for their depletion
CO4	Find and implement scientific, technological, economic and political solutions to environmental problems.
CO5	Relate how human population affects the environment, describe the role of IT in environment and human health

Course code	C214
Subject code	ME6404
Subject name	**Thermal Engineering**
COURSE OUTCOMES	
CO1	List the different processes involved in elementary operations of gas power cycles, calculate and compare the efficiencies of various gas-powered cycles, find the effect of different volume and pressure ratios on the performance of the cycles
CO2	Identify various components of IC engines, sketch valve timing and port timing diagram of IC engines, conduct performance testing of IC engines
CO3	Explain the working of various types of air compressors, identify the area of application of single stage and multi-stage air compressor and calculate respective efficiencies
CO4	Sketch velocity diagram of single and multistage turbines
CO5	Calculate COP of vapor refrigeration systems using refrigeration chart and tables

Course code	C215
Subject code	ME6411
Subject name	**Manufacturing Technology II Laboratory**
COURSE OUTCOMES	
CO1	Create complicated channels using various machine tools
CO2	Manufacture gears using various machine tools
CO3	Develop CNC part programming
CO4	Measure various cutting forces on a cutting tool
CO5	Manufacture tools using cutter grinder

Course code	C216
Subject code	ME6412
Subject name	**Thermal Engineering I Laboratory**
COURSE OUTCOMES	
CO1	Draw valve timing diagram for a single 4-stroke engine and port timing diagram for a 2-stroke engine
CO2	Calculate the mechanical efficiency of four stroke SI engine by Morse test.
CO3	Find out the indicated power of multicylinder engine
CO4	Find out frictional power of a diesel engine by performing retardation test
CO5	Study the fuel and lubricant characteristics namely flash and fire points and also describe the operating principle of Steam Generator and Steam Turbine

Course code	C217
Subject code	CE6315
Subject name	**Strength of Materials Laboratory**
COURSE OUTCOMES	
CO1	Calculate the yield stress, breaking stress and ultimate stress of a specimen when subjected to different types of loading
CO2	Classify various heat treatment process
CO3	Compare Rockwell hardness test with Brinell hardness and measure the hardness of the given specimen.
CO4	Illustrate the microstructure behavior on ferrous and non-ferrous materials.
CO5	Examine the stiffness of the open coil and closed coil spring and grade them.

V - SEMESTER

Course code	C301
Subject code	ME 8595
Subject name	**THERMAL ENGINEERING-II**
COURSE OUTCOMES	
CO1	To have a study about Otto, diesel, dual, brayton cycles and gather information about actual and theoretical PV diagram of four stroke and two stroke engines.
CO2	Equip concept of valve timing diagram and port timing diagram and lubrication system and cooling system.
CO3	To enhance the study of flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow, impulse and reaction principles, compounding, velocity diagram for simple and multi-stage turbines, speed regulations.
CO4	To know the basic classification and working principle of various types of compressors, work of Compression with and without clearance, volumetric efficiency, isothermal efficiency and isentropic efficiency of reciprocating compressors, multistage air compressor cooling.
CO5	To learn the types of refrigeration and air conditioning and calculating the humidity by using psychometric chart.

Course code	C302
Subject code	ME8594
Subject name	**Dynamics of Machines**
COURSE OUTCOMES	
CO1	Analyze the inertia and dynamic force in mechanical system such as engine, connecting rod, bearing and flywheel.
CO2	Evaluate the balancing of rotating and reciprocating masses of the engines.
CO3	Compare and contrast the types of damping in vibration of shafts with defined degrees of freedom.
CO4	Distinguish forced vibration as a result of harmonic / unbalance disturbances and its measurement.
CO5	Estimate the speed of governors and determine the gyroscopic couple / effect.

Course code	C303
Subject code	ME6503
Subject name	**Design of Machine Elements**
COURSE OUTCOMES	
CO1	To calculate principal stresses in machine members under steady and variable loading.
CO2	To propose required shafts and couplings for the given application.
CO3	To design the parameters of permanent and temporary joint on various types of loading application.
CO4	To design energy storage elements such as springs / fly wheels and connecting rod
CO5	To select the sliding / rolling contact bearing forthe given application.

Course code	C304
Subject code	ME8501
Subject name	**Metrology and Measurements**
COURSE OUTCOMES	
CO1	To explain the fundamentals of metrology like precision, accuracy, error and standards.
CO2	To classify linear and angular measuring instruments and explain the principle of working.
CO3	To describe laser metrology, auto collimator, CMM and itsapplications.
CO4	To use form measurement techniques forthe given component.
CO5	To describe principles of flow, power and temperature measuring instruments.

Course code	C305
Subject code	ORO551
Subject name	**Renewable Energy Sources**
COURSE OUTCOMES	
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

Course code	C306
Subject code	ME8511
Subject name	**Kinematics and Dynamics Laboratory**
COURSE OUTCOMES	
CO1	Ability to demonstrate the principles of kinematics of machinery.
CO2	Ability to demonstrate the principles of dynamics of machinery.
CO3	Ability to use the measuring devices for dynamic testing.
CO4	Ability to study the parameters of kinematics of machinery.
CO5	Ability to study the parameters of dynamics of machinery.

Course code	C307
Subject code	ME8512
Subject name	**Thermal Engineering Laboratory II**
COURSE OUTCOMES	
CO1	Ability to determination of Thermal conductivity for a given material.
CO2	Ability to determination of heat transfer coefficient for a given equipment.
CO3	Ability to determination of Stefan Boltzmann constant and emissivity of a grey surface
CO4	Ability to determination of effectiveness of a heat exchanger and cooling tower performance characteristics.
CO5	Ability to determination of COP of an AC, refrigeration system and air compressor performance characteristics.

Course code	C308
Subject code	ME8513
Subject name	**Metrology and Measurements Laboratory**

COURSE OUTCOMES	
CO1	To provide knowledge on various Metrological equipments available to measure the dimension of the components.
CO2	To get familiar with flatness measurement equipment and surface roughness measurement
CO3	To provide knowledge about force, torque, temperature, displacement and vibration measurements
CO4	To provide knowledge about Use of slip gauges, Sine bar and measurement of Screw threads & Gear tooth parameters.
CO5	To Calibrate the measuring equipments using slip gauge

VI - SEMESTER

Course code	C309
Subject code	ME8651
Subject name	**DESIGN OF TRANSMISSION SYSTEMS**

COURSE OUTCOMES	
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.

Course code	C310
Subject code	ME8691
Subject name	**Computer Aided Design and Manufacturing**

COURSE OUTCOMES	
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

Course code	C311
Subject code	ME8693
Subject name	Heat and Mass Transfer

COURSE OUTCOMES	
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

Course code	C312
Subject code	ME8692
Subject name	FINITE ELEMENT ANALYSIS

COURSE OUTCOMES	
CO1	Explain the steps involved in FEA and also the types of weight residual methods.
CO2	Formulate FEA equation for structural, heat transfer and vibration problems.
CO3	Predict finite element equations for two dimensional thermal and torsion problems.
CO4	Predict finite element equations for axisymmetric bodies, plate and shell.
CO5	Apply matrix solution techniques to dynamic problems.

Course code	C313
Subject code	ME8694
Subject name	**HYDRAULICS AND PNEUMATICS**
COURSE OUTCOMES	
CO1	Explain the Fluid power and operation of different types of pumps
CO2	Summarize the features and functions of Hydraulic motors, actuators and Flow control 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.

Course code	C314
Subject code	ME8091
Subject name	**AUTOMOBILE ENGINEERING**
COURSE OUTCOMES	
CO1	Explain the various types of chassis, frame and functions of IC engine parts.
CO2	Describe the engine auxiliary system used in SI and CI engine.
CO3	Distinguish between the manual transmission systems with automatic transmission systems.
CO4	Demonstrate how the steering, brakes and the suspension system operate.
CO5	Justify the importance of alternative fuels.

Course code	C315
Subject code	ME8681
Subject name	**CAD/CAM LABORATORY**
COURSE OUTCOMES	
CO1	Create 2D and 3D models using modelling software.
CO2	Understand the CNC control in modern manufacturing system.
CO3	Prepare CNC part programming and perform manufacturing.
CO4	Create the CL Data and Post process generation using CAM packages.
CO5	Apply CAPP in Machining and Turning Centre.

Course code	C316
Subject code	ME8682
Subject name	**Design and Fabrication Project**
COURSE OUTCOMES	
CO1	Identify a topic in advanced areas of Mechanical Engineering
CO2	Identify methods and materials to carry out experiments/develop code
CO3	Review literature to identify gaps and define objectives & scope of the work
CO4	Reorganize the procedures with a concern for society, environment and ethics
CO5	Generate and implement innovative ideas for social benefit

Course code	C317
Subject code	HS8581
Subject name	**Professional Communication**
COURSE OUTCOMES	
CO1	Apply appropriate communication skills across settings, purposes, and audiences.
CO2	Demonstrate knowledge of communication theory and application.
CO3	Practice critical thinking to develop innovative and well-founded perspectives related to the students' emphases.
CO4	Build and maintain healthy and effective relationships. Use technology to communicate effectively in various settings and contexts.
CO5	Demonstrate appropriate and professional ethical behavior.

VII - SEMESTER	
Course code	**C401**
Subject code	**ME8792**
Subject name	**POWER PLANT ENGINEERING**
COURSE OUTCOMES	
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.

Course code	**C402**
Subject code	**ME8793**
Subject name	**PROCESS PLANNING AND COST ESTIMATION**
COURSE OUTCOMES	
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.

Course code	C403
Subject code	ME8791
Subject name	**MECHATRONICS**

COURSE OUTCOMES	
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, AddressingModes of Microprocessor and Microcontroller
CO3	Discuss Programmable Peripheral Interface, Architecture of 8255 PPI, and various deviceinterfacing
CO4	Explain the architecture, programming and application of programmable logic controllersto 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

Course code	C404
Subject code	OMF751
Subject name	**Lean six sigma**

COURSE OUTCOMES	
CO1	Explain the concepts of Lean Manufacturing and Six Sigma
CO2	Identify the wastes and suggest means for improving productivity
CO3	Identify lean metrics and inspect it in the area of work
CO4	Apply lean and six sigma tools for decision making problems
CO5	Criticize Six Sigma practices in quality problems

Course code	C405
Subject code	ME8073
Subject name	**Unconventional Machining Processes**
COURSE OUTCOMES	
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

Course code	C406
Subject code	ME8097
Subject name	**NON DESTRUCTIVE TESTING AND EVALUATION**
COURSE OUTCOMES	
CO1	Explain the fundamental concepts of NDT
CO2	Discuss the different methods of NDE
CO3	Interpret the concept of Thermography and Eddy current testing
CO4	Employ the concept of Ultrasonic Testing and Acoustic Emission
CO5	Employ the Radiography testing for engineering applications

Course code	C407
Subject code	ME8711
Subject name	**Simulation and Analysis Laboratory**

COURSE OUTCOMES	
CO1	To get familiar with the Finite Element (FE) modeling of structural elements with loading and boundary conditions
CO2	Simulate the working principle of air conditioning system, hydraulic and pneumatic cylinder and cam follower mechanisms using MATLAB.
CO3	Analyze the stresses and strains induced in plates, brackets and beams and heat transfer problems.
CO4	Understand and solve core mechanical engineering problems using MATLAB computational package.
CO5	Calculate the natural frequency and mode shape analysis of 2D components and beams.

Course code	C408
Subject code	ME8781
Subject name	**Mechatronics Laboratory**

COURSE OUTCOMES	
CO1	To enable the students to understand the concept of mechatronics
CO2	Demonstrate the functioning of mechatronics system with various pneumatic, hydraulic and electrical systems.
CO3	Demonstrate the functioning of control systems with the help of PLC and microcontrollers.
CO4	Explain the method of programming the PLC and Labview
CO5	Understand the concept of image processing

Course code	C409
Subject code	ME8712
Subject name	**Technical Seminar**

COURSE OUTCOMES	
CO1	Understand the importance of team work
CO2	Enrich the presentation skills
CO3	Effective communication skills
CO4	Highly Leadership skills
CO5	Engage in independent and lifelong learning

VIII - SEMESTER	
Course code	C410
Subject code	ME6811
Subject name	Project work
COURSE OUTCOMES	
CO1	Identify a topic in advanced areas of Mechanical Engineering Identify methods and materials to carry out experiments/develop code
CO2	Review literature to identify gaps and define objectives & scope of the work Reorganize the procedures with a concern for society, environment and ethics
CO3	Generate and implement innovative ideas for social benefit Analyze and discuss the results to draw valid conclusions
CO4	Develop a prototypes/models, experimental set-up and software systems necessary to meet the objectives Prepare a report as per recommended format and defend the work
CO5	Explore the possibility of publishing papers in peer reviewed journals/conference proceedings