Course Outcomes of all courses

Subject: BASIC THERMODYNAMICS	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Explain thermodynamic systems, properties, Zeroth law of thermodynamics, temperature scales and energy interactions.
CO-2	Determine heat, work, internal energy, enthalpy for flow &non-flow process using First and Second Law of Thermodynamics.
CO-3	Determine change in internal energy, change in enthalpy and change in entropy using TDS relations for ideal gases
CO-4	Incorporate available energy and unavailable energy. Interpret behaviour of pure substances and its applications to practical problems.
CO-5	Calculate Thermodynamics properties of real gases at all ranges of pressure, temperatures using modified equation of state including Vander Waals equation, Redlich Wong equation and Beattie-Bridgeman equation

Subject: Computer Aided Machine Drawing	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Improve their visualization skills.
CO-2	Understand the theory of projection.
CO-3	Make component drawings.
CO-4	Produce the assembly drawings using part drawings.
CO-5	Engage in lifelong learning using sketching and drawing as communication tool.

Subject: Metal casting & welding	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Describe the casting process, preparation of Green, Core, dry sand moulds and Sweep, Shell, Investment and plaster moulds. Explain the Pattern, Core, Gating, Riser system and Jolt, Squeeze, Sand Slinger Moulding Machines.
CO-2	Compare the Gas fired pit, Resistance, Coreless, Electrical and Cupola Metal Furnaces; Compare the Gravity, Pressure die, and Centrifugal, Squeeze, slush and Continuous Metal mould castings.
CO-3	Explain the Solidification process and Casting of Non-Ferrous Metals.
CO-4	Describe the Metal Arc, TIG, MIG, Submerged and Atomic Hydrogen Welding processes used in manufacturing. Explain the Resistance, Explosive, Thermit, Laser and Electron Beam Special type of welding process used in manufacturing.
CO-5	Describe the Metallurgical aspects in Welding and inspection for the quality assurance of product made of casting and joining process.

Subject: MMM	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understand the concepts of Metrology, Standards, Calibration and apply knowledge of Linear, Angular measurements
CO-2	Understand the various types of comparators and their applications along with system of Limits, tolerance and gauging principles
CO-3	Describe Screw thread, Gear terminology and their measurements using different methods and understand Laser, CMM machines
CO-4	Explain measuring system, its components, transducers, Primary, Intermediate Transducing devices.
CO-5	Describe Terminating and Mechanical measurements --Force, Temperature, Pressure and Strain measuring devices

Subject MECHANICS OF MATERIALS	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understand simple, compound, thermal stresses and strains their relations, Poisson's ratio, Hooke's law, mechanical properties including elastic constants and their relations. Determine stresses, strains and deformations in bars with varying circular and rectangular cross-sections subjected to normal and temperature loads.
CO-2	Determine plane stress, principal stress, maximum shear stress and their orientations using analytical method and Mohr's circle. Determine the dimensions of structural members including beams, bars and rods using Energy methods and also stress distribution in thick and thin cylinders
CO-3	Draw SFD and BMD for different beams including cantilever beams, simply supported beams and overhanging beams subjected to UDL, UVL, Point loads and couples. Determine dimensions, bending stress, shear stress and its distribution in beams of circular, rectangular, symmetrical I and T sections subjected to point loads and UDL. Determine slopes and deflections at various points on beams subjected to UDL, UVL, Point loads and couples
CO-4	Determine the dimensions of shafts based on torsional strength, rigidity and flexibility and also to determine elastic stability of columns using Rankin's and Euler's theory.
CO-5	Understand the concept of strain energy and compute strain energy for applied loads and apply the theories of failures.

Subject: MATERIAL SCIENCE	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Describe the mechanical properties of metals, their alloys and various modes of failure
CO-2	Understand the microstructures of ferrous and non-ferrous materials to mechanical properties.
CO-3	Explain the processes of heat treatment of various alloys.
CO-4	Understand the properties and potentialities of various materials available and material selection procedures.

CO-5	Know about composite materials and their processing as well as applications.

Subject: MACHINE TOOLS AND OPERATIONS	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	To Explain the construction and specification of various machine tools
CO-2	To Describe various machining process pertaining to relative motion between tool and work piece
CO-3	To discuss different cutting tool materials, tool nomenclature and surface finish
CO-4	To apply mechanics of machining process to evaluate machining time
CO-5	To analyze tool wear mechanisms and equations to enhance tool life and minimizing machining cost

Subject: FOUNDRY AND FORGING Lab	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	To provide an insight in to different sand preparation and foundry equipment
CO-2	To Provide an insight in to different forging tools and equipments
CO-3	To provide training to students to enhance their practical skills
CO-4	To practically demonstrate precautions to be taken during casting and hot working
CO-5	To develop team qualities and ethical principles

Subject: Machine Shop LAB	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	List the different parts of lathe, shaping and milling machines
CO-2	Develop the model independently by using lathe
CO-3	Develop the model independently by using shaping
CO-4	Differentiate between shaping and planning
CO-5	Calculate the index crank movement for cutting gears/teeth using simple indexing method.

Subject Mechanical Measurements and Metrology Lab	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	To Calibrate Pressure Gauge, LVDT, Thermocouple, Load Cell, Micrometer
CO-2	To Measure Angle Using, Sine Bar, Sine Center, Bevel Protractor, Alignment Using Autocollimator
CO-3	To Demonstrate Measurements Using Toolmakers Microscope, Optical Projector, Optical Flates

CO-4	To Measure Screw Thread Parameters, Gear Tooth Profile Using 2- Wire Method, Vernier Gear Tooth Micrometer
CO-5	To Measure Surface Roughness Using Comparator and To Measure Cutting Tool Forces Using Lathe, Drill Tool Dynamometers

MATERIAL TESTING LAB	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Acquire experimentation skills in the field of material testing
CO-2	Develop theoretical understanding of the mechanical properties of materials by performing experiments
CO-3	Apply the knowledge to analyze a material failure and determine the failure inducing agent/s.
CO-4	Apply the knowledge of testing methods in related areas
CO-5	Know how to improve structure/behaviour of materials for various industrial applications

Subject: APPLIED THERMODYNAMICS	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Apply thermodynamic concepts to analyze the performance of gas power cycles including propulsion systems.
CO-2	Understand combustion of fuels and combustion processes in I C engines including alternate fuels and pollution effect on environment. Apply thermodynamic concepts to analyze turbo machines.
CO-3	Determine performance parameters of refrigeration and air-conditioning systems. Understand the principles and applications of refrigeration systems.
CO-4	Analyze air-conditioning processes using the principles of psychrometry and Evaluate cooling and heating loads in an air-conditioning system.
CO-5	Understand the working, applications, relevance of air and identify methods for performance improvement

Subject: FLUID MECHANICS	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Identify and calculate the key fluid properties used in the analysis of fluid behaviour, Understand and apply the principles of pressure, buoyancy and floatation

CO-2	Apply the knowledge of fluid statics, kinematics and dynamics while addressing problems of mechanical and chemical engineering.
CO-3	Understand and apply the principles of fluid kinematics and dynamics.
CO-4	Understand the concept of boundary layer in fluid flow and apply dimensional analysis to form dimensionless numbers in terms of input output variables.
CO-5	Understand the basic concept of compressible flow and CFD

Subject: KINEMATICS OF MACHINES	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understand and identify the working of mechanisms and their applications.
CO-2	Analyse the mechanisms with their velocity and acceleration diagrams through graphical approach.
CO-3	Function on multi-disciplinary teams.
CO-4	Analyse the mechanisms with their velocity and acceleration through analytical approach.
CO-5	Design the working profile of cam and analyse its outcome.

Subject: DESIGN OF MACHINE ELEMENTS I	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Apply the design standards and codes to analyze the stresses induced in the various components having different cross-section based on the type of load and their direction.
CO-2	Analyse and design threaded fasteners subjected to static, dynamic and fatigue loading together with eccentric loads and to solve problems using factor of safety for different components.
CO-3	Design and analyze the shafts subjected to fluctuating and combined loads, keys, couplings as well as cotter and knuckle joints.
CO-4	Analyse and design riveted joints, brackets and welded joints subjected to eccentric load and also to demonstrate the engineering solutions related to the design problems encountered.

Subject: DYNAMICS OF MACHINERY	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Gain the knowledge of static and dynamic equilibrium and analyse for four-bar and slider crank mechanisms with and with-out friction
CO-2	Understand the principles of balancing of rotating and reciprocating masses.
CO-3	Understand analyse the equilibrium of governors and gyroscopes for their respective applications
CO-4	Understand vibrations characteristics of single degree of freedom systems.
CO-5	Characterise the single degree freedom systems subjected to free and forced vibrations

	with and without damping

Subject: ENERGY & ENVIRONMENT	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Summarize the basic concepts of energy, its distribution and general Scenario.
CO-2	Explain different energy storage systems, energy management, audit and economic analysis.
CO-3	Summarize the environment eco system and its need for awareness.
CO-4	Identify the various types of environment pollution and their effects.
C05	Discuss the social issues of the environment with associated acts.

Subject: Management & Engineering Economics	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understand needs, functions roles, scope, evolution of management and purpose of planning and analyze.
CO-2	Discuss decision making, organizing, staffing, Directing and controlling.
CO-3	select best economical model from various available alternatives.
CO-4	Understand various interest rate methods and implement the suitable one.
CO-5	Estimate various depreciation values of commodities.

Subject: NON-TRADITIONAL MACHINING	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Select a suitable machining process to produce different shapes of required accuracy.
CO-2	Evaluate the effects of different processes parameters.
CO-3	Analysis and apply the various metal machining techniques to produce different shapes.
CO-4	Participate and succeed in competitive examinations.
C05	Machining process applications

Subject: Turbo machines	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Define and classify the TM, Identify and describe the parts of TM. Understand the applications of Dimensionless numbers for solving fluid flow problems. Apply the knowledge of Thermodynamics of fluid flow to study various efficiencies of fluids and Reheat factor
CO-2	Apply the Euler's Turbine equation to obtain the velocity diagram and analysis of velocity diagram of a turbo machine with suitable scale ratio.

CO-3	Evaluate conditions for max. Blade efficiencies for different steam turbines Solve the problems using the velocity diagrams to obtain power output, rotor efficiency, etc for Steam and Hydraulic turbines.
CO-4	Evaluate the performance of centrifugal pump for single stage and multistage. Solve the problems using the velocity diagrams to obtain power output, rotor efficiency, etc for centrifugal pump
CO-5	Evaluate the performance of Compressors. Solve the problems using the velocity diagrams to obtain power output, rotor efficiency, etc of axial flow compressors.

Subject: MPIII	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Select a suitable metal forming process to produce different shapes. Evaluate the effect of different process parameters.
CO-2	Design a system & conduct experiment experiments analyse and interpret stress strain concepts.
CO-3	Identify the forging and rolling process. Design a system, extrusion process, component or process as per needs & Specification
CO-4	Analyze and apply the various metal forming techniques to produce different die shapes. Skills to use high energy rate forming processes for producing more complex shapes.
CO-5	Apply the powder metallurgy techniques to produce different shapes by controlling their metallurgy with different alloying elements.

Subject: ENERGY CONVERSION LAB	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Perform experiments to determine the properties of fuels and oils.
CO-2	To determine calorific value of fuel and viscosity of given fuel/oils
CO-3	Conduct experiments on engines and draw characteristics and Test basic performance parameters of I.C. Engine and implement the knowledge in industry
CO-4	Identify exhaust emission, factors affecting them and report the remedies.
CO-5	Determine the energy flow pattern through the I C Engine and Exhibit his competency towards preventive maintenance of IC engines.

Subject: FM LAB
COURSE OUTCOME STATEMENT

	At the end of the course, students will be able to ….
CO-1	Perform experiments to determine the coefficient of discharge of flow measuring devices.
CO-2	Conduct experiments on hydraulic turbines and pumps to draw characteristics
CO-3	Test basic performance parameters of hydraulic turbines and pumps and execute the knowledge in real life situations.
CO-4	Determine the energy flow pattern through the hydraulic turbines and pumps
CO-5	Exhibit his competency towards preventive maintenance of hydraulic machines

Subject: Computer integrated manufacturing	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	To impart knowledge of CIM and Automation and different concepts of automation by developing mathematical models.
CO-2	To make students to understand the Computer Applications in Design and Manufacturing [CAD / CAM) leading to Computer integrated systems. Enable them to perform various transformations of entities on display devices.
CO-3	To expose students to automated flow lines, assembly lines, Line Balancing Techniques, and Flexible Manufacturing Systems.
CO-4	To expose students to automated flow lines, assembly lines, Line Balancing Techniques, and Flexible Manufacturing Systems.
CO-5	To expose the students to CNC Machine Tools, CNC part programming, and industrial robots. To introduce the students to concepts of Additive Manufacturing, Internet of Things, and Industry 4.0leading to Smart Factory.

Subject: DESIGN OF MACHINE ELEMENTS II	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Analyze & design curved beams, compound cylinders along with behaviour of stresses and power transmission elements
CO-2	Analyze & design helical compression & tension springs with respect to static & dynamic axial loads
CO-3	Analyze & design spur, helical, bevel, & worm gears with respect to tooth bending strength. Analyze and design various types of brakes and clutches and check for heat generation and dissipation
CO-4	Understand the principle operation of bearings, and the properties of lubricants. Also analyze and design the different parts of IC Engine.

Subject: Finite Element Method	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understand the concepts behind formulation methods in FEM
CO-2	Identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.
CO-3	Develop element characteristic equation and generation of global equation.
CO-4	Able to apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts and solve them displacements, stress and strain induced
CO-5	Able to apply suitable boundary conditions to a global equation for heat transfer, fluid flow, axi symmetric and dynamic problems and solve them displacements, stress and strain induced

Subject: HEAT TRANSFER	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understand the basic concepts of laws governing modes of heat transfer, analyse different types of boiling and condensation process and basic terms used in mass transfer analysis.
CO-2	Analyse One dimensional transient heat conduction in solids with negligible internal temperature gradient (lumped system analysis) using transient temperature charts and derive general 3D conduction equation in Cartesian coordinate system along with Concepts of overall heat transfer co-efficient
CO-3	Explain the boundary layer concepts and applications of dimensional analysis for free and forced convection, recite the significance of dimensionless numbers.
CO-4	Explain different types of heat exchangers and analyse the LMTD & NTU for parallel and counter flow heat exchangers
CO-5	Explain the basic laws and terms used in radiation heat transfer

Subject: METAL FORMING	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Able to understand the concept of different metal forming processes
CO-2	Able to understand different yield criteria
CO-3	Able to approach metal forming processes both analytically and numerically
CO-4	Able to design metal forming processes

CO-5	Able to understand high energy rate forming methods and powder metallurgy

Subject: MECHATRONICS AND MICROPROCESSOR	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understand the concept of measurement and control system, working principle and applications of light sensor
CO-2	Define electrical systems, mechanical switches and understand the operational amplifier, digital signals and multiplexers
CO-3	Discuss the evaluation of micro-processor and understand the concept of conversion of real numbers, floating point notations, and over flow and underflow
CO-4	Understand the basic elements of control system 8085A and differentiate between microprocessor and microcontroller
CO-5	Analyze the organization of INTEL 8085 data address buses, programming 8085 processor and example of Intel 8085 and 4004 register organization

Subject: TQM	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Explain the various approaches of TQM
CO-2	Infer the customer perception of Quality
CO-3	Analyze customer needs and perceptions to design feedback system
CO-4	Apply statistical tools for continuous improvement of systems
CO-5	Apply statistical tools for industrial improvement

Subject: CAMA LAB	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Use the computer aided techniques to facilitate the process of product design and development
CO-2	Identify a set of design variables and the governing equations to analyze a conceptual design
CO-3	Optimize the mesh size and type and apply appropriate types of boundary constraints in the CAE process
CO-4	Analyze and optimize a design with the aid of modern CAE software.
CO-5	To apply the basic principles to carry out dynamic analysis to know the natural frequency of different kind of beams.

Subject: HEAT TRANSFER LAB	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….

CO-1	Perform experiments to determine the thermal conductivity of a metal rod
CO-2	Conduct experiments to determine convective heat transfer coefficient for free and forced convection and correlate with theoretical values
CO-3	Estimate the effective thermal resistance in composite slabs and efficiency in pin-fin
CO-4	Estimate performance of a refrigerator and effectiveness of fin
CO-5	Estimate the effectiveness and NTU of parallel and counter flow Heat exchanger and Determine surface emissivity and Stefan Boltzmann constant .

Subject: ENGINEERING ECONOMICS	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understand the fundamentals of the Engineering economics.
CO-2	Compare the various Project(s) using present worth/ Equivalent Annual worth methods.
CO-3	Compute the rate of return of the Project(s)
CO-4	Determine the Depreciation charges of the Machine/Equipment.
CO-5	Analyze the various alternatives & criteria of replacement and predict the effect of inflation on it.

Subject: EXPERIMENTAL STRESS ANALYSIS	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Apply the method of electrical resistance strain gauges to study & characterize the behaviour of solid bodies.
CO-2	Analyse the strains induced using strain gauge rosettes.
CO-3	Illustrate the basic principles of photo elasticity, 2-D, 3-D photo elasticity and use it as an analysis tool.
CO-4	Determine stress-strain behaviour of solid bodies using methods of photo-elastic & brittle coatings.
CO-5	Analyse moire fringe by geometrical approach and displacement method.

Subject: HYDRAULICS AND PNEUMATICS	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Differentiate between the terms hydraulics and pneumatics. Specify the fluid power systems. Apply Pascal's law to a hydraulic system. Explain the operation and various performance factors of gear, vane, and piston pumps.
CO-2	Explain the operation and features of hydraulic actuators and motors.
CO-3	To understand the various control components such as PCV,FCV,DCV
CO-4	Describe the operation of a complete hydraulic circuit drawn with symbols for all components and its maintenance.
CO-5	Demonstrate the purpose, construction, and operation of a pneumatic system. State the operating principles of fluidic devices, Understand the operation of electrical components used in electromechanical relay control systems.

Subject: MECHANICAL VIBRATIONS	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Discuss the importance of vibrations and Fourier theorem applied to engineering problems.
CO-2	Design various vibrations measuring instruments and Predict free and forced (harmonic, periodic, non-periodic) vibration of continuous systems.
CO-3	Compose linear vibratory models of dynamic systems with changing complexities (SDOF, MDOF), and of real life engineering systems.
CO-4	Formulate free and forced (harmonic, periodic, non-periodic) vibration response of single and multi-degree of freedom systems
CO-5	Analyse the signals using condition monitoring technique.

Subject: OPERATION RESEARCH	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understanding the basics of decision making and solving the LPP by various methods
CO-2	Finding the optimal solution for transportation and assignment problem
CO-3	Solving the project evaluation and network problems, queuing theory, service pattern and arrival pattern
CO-4	Finding the optimal strategy of a player using various dominance rule and by graphical method, sequencing of various jobs on various machines and graphical method

Subject: CIMLAB	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Generate CNC Lathe part program for Turning, Facing, Chamfer, Grooving, Step turning, Taper turning, circular interpolation etc.
CO-2	Generate CNC Mill part programming for point to point motions, line motions, circular interpolation, contour motion, pocket milling-circular, rectangular, mirror commands etc
CO-3	Use canned cycles for drilling, peck drilling, Boring, Tapping, Turning , Facing, Taper turning thread cutting etc
CO-4	Simulate tool path for different machining operations of small components using CNC Lathe & CNC Milling machine
CO-5	Use high end CAM packages for machining complex parts ; use state of art cutting tools and related cutting parameters; optimize cycle time .

Subject: Design Lab	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	To understand the working principles of machine elements such as Governors, Gyroscopes, etc..
CO-2	To identify forces and couples in rotating mechanical system components as well as natural frequency, logarithmic decrement, damping ratio and damping Coefficient in a single degree of freedom vibrating systems
CO-3	To identify vibrations in machine elements and design appropriate damping methods and to determine the critical speed of a rotating shaft.
CO-4	To determine the minimum film thickness, load carrying capacity, frictional torque and pressure distribution of journal bearing
CO-5	To measure strain in various machine elements using strain gauges and determine strain induced in a structural member using the principle of photo-elasticity

Subject: AUTOMOVITVE ENGG	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Compare different combustion chamber for I C engines and Explain methods of cooling and lubrication.
CO-2	Distinguish between supercharger and turbocharger with construction and operation.
CO-3	Describe battery, magneto and electronic ignition system and analyze emission standards.
CO-4	Classify suspension system and distinguish between mechanical, vacuum, hydraulic breaking system and analyze steering mechanism.
CO-5	Identify various pollutants and Understand emission standards.

Subject: FOUNDRY TECHNOLOGY	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Students can able to demonstrate the oxidation of liquid metals, gas dissolution in liquid metals, method of degassing, fluidity, factors affecting fluidity, fluidity tests, hot tearing, shrinkage of liquid metals.
CO-2	Introduction to casting design, redesign considerations, design for minimum casting stresses, Design for directional solidification for different condition.
CO-3	students can able understand the concept of crystallization and development of cast structure and concept of progressive and directional solidification, need of gating system and rise ring system in casting methods
CO-4	students can able to demonstrate the special moulding technique for manufacturing different components by using different pattern , developments in cupola melting-- Hot blast cupola, water cooled cupola, Balanced blast cupola, coke less cupola, cupola charge calculations, ferrous foundry; Melting procedures, casting characteristics , production , specification and properties of some ferrous metals

CO-5	Students can able to demonstrate the non ferrous foundry; Melting procedures, casting characteristics, production, specification and properties of some typical aluminium, copper and magnesium based alloy castings. Modernization and mechanization in foundry techniques

Subject: CONTROL ENGINEEREING	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Understand the concepts of control systems and build a mathematical model for non-electrical systems using analogy concept.
CO-2	Understand block diagram concepts and represent the same for different control systems
CO-3	Determine the time response of different order systems for various inputs
CO-4	Analyze the stability of the control systems using various techniques and Discuss the system compensation,
CO-5	Express and solve system equations in state variable form

Subject: OM	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Define production and operation management, basic approach of new and old systems of management
CO-2	Develop decision process, list the characteristics of decision-making and forecasting techniques
CO-3	Analyze the importance of capacity and location planning
CO-4	Apply the aggregate planning and plan for effective inventory management
CO-5	Discuss the overview of MRP-II and ERP capacity requirement planning and apply importance of purchasing and SCM

Subject: Project Work	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Interpret various Engineering problems
CO-2	Design and carryout a project for current industrial standards
CO-3	Demonstrate an ability to work in laboratory and industrial site on multidisciplinary tasks in teams
CO-4	Observe experimentally the impact of engineering solutions on society and need for sustainable development.
CO-5	Evaluate knowledge of contemporary issues and able to apply effectively for project Management.

Subject: SEMINAR	
COURSE OUTCOME STATEMENT	
	At the end of the course, students will be able to ….
CO-1	Students will better understand the role that effective presentations have in public/professional contexts and gain experience in formal/ informal presentation
CO-2	Students will demonstrate the ability to discern the assignment's intended audience and objectives and respond appropriately

CO-3	Students will be able to construct a paper consistent with expectations of the discipline, including an appropriate organization, style, voice and tone
CO-4	Students will be able to access information in a variety of ways appropriate to a discipline, including locating and using library collections and services and other search tools and DB.
CO-5	Students will demonstrate the ability to collaborate with others as they work on intellectual projects (reading, writing, speaking, researching...).