Ref. AIKTC/MECH/PO/ Date:18/09/19

Program Outcomes (POs) & Program Specific Outcomes (PSOs)

School/ Department: SoET/Mechanical, AIKTC

Batch: 2019-23

PO No.	Program Outcomes (POs)
1	Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the conceptualization of engineering models.
2	Identify, formulate, research literature and solve complex engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.
3	Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
4	Conduct investigations of complex problems including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions.
5	Create, select and apply appropriate techniques, resources, and modern engineering tools, including prediction and modelling, to complex engineering activities, with an understanding of the limitations
6	Demonstrate understanding of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice.
7	Understand the impact of engineering solutions in a societal context and demonstrate knowledge of and need for sustainable development.
8	Understand and commit to professional ethics and responsibilities and norms of engineering practice.
9	Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings.
10	Communicate effectively on complex engineering activities with the engineering community anvd with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	Demonstrate a knowledge and understanding of management and business practices, such as risk and change management, and understand their limitations.
12	Recognize the need for, and have the ability to engage in independent and life-long learning
PSO No.	**Program Specific Outcomes (PSOs)**
1	Apply the acquired knowledge and exposure of Mechanical Engineering concepts for solving real life problems.
2	Understand the functioning of manufacturing and design industries.

Program Owner/ Chairperson

Dr. Abdul Razak Honnutagi
Director

CC to: All Concerned

Sr. No	Semester	Course	CO Number	Course Outcome
1	I	Engineering mathematics-I	CO 01	Apply the basic concepts of Complex Numbers to find roots and to express function as sine and cosine series
			CO 02	Apply the knowledge of complex numbers to study Hyperbolic and logarithmic functions.
			CO 03	Apply the basic concepts of partial differentiation of function of several variables
			CO 04	Apply the concept of Maxima, Minima and Successive differentiation and will be able to use it for optimization and tuning the systems.
			CO 05	Apply the knowledge of Matrices to solve a set of linear simultaneous equations.
			CO 06	Apply Numerical methods to solve Transcendental & system of linear simultaneous equations.
2	I	Engineering Physics-I	CO 01	Recall and apply quantum mechanical ideas to the motion of the particles.
			CO 02	Identify different types of crystal structures based on various parameters.
			CO 03	Identify types of semiconducting materials by Hall Effect and their various applications
			CO 04	Compare interference of light in various thin films and recognize applications in Science and
			CO 05	Recalls the behaviour and types of Superconductors and Supercapacitors.
			CO 06	Identify different engineering materials and their applications.
3	I	Engineering Chemistry-I	CO 01	Explain the concept of microscopic chemistry in terms of atomic and molecular orbital theory and relate it to diatomic molecules.
			CO 02	Describe the concept of aromaticity and interpret it with relation to specific aromatic systems.
			CO 03	Illustrate the knowledge of various types of intermolecular forces and relate it to real gases.
			CO 04	Interpret various phase transformations using thermodynamics.
			CO 05	Apply the knowledge of polymers, fabrication methods, conducting polymers in various industrial fields.
			CO 06	Determine the hardness of water and suggest suitable methods of treatment
4	I	Engineering Mechanics	CO 01	Illustrate the concept of force, moment and apply the same along with the concept of equilibrium in two and three dimensional systems with the help of Free Body Diagrams (FBDs)
			CO 02	Demonstrate the understanding of Centroid and its significance and locate the same
			CO 03	Correlate real life application to specific type of friction and estimate required force to overcome friction
			CO 04	Establish relation between velocity and acceleration of a particle and analyse the motion by plotting the relation between them
			CO 05	Illustrate different types of motions and establish Kinematic relations for a rigid body
			CO 06	Analyse body in motion using force and acceleration, work-energy, impulse-momentum principles
			CO 01	Apply various network theorems to determine the circuit response / behavior.
			CO 02	Evaluate and analyze 1-Φ circuits.

Sr. No	Semester	Course	CO Number	Course Outcome
5	I	Basic Electrical Engineering	CO 03	Evaluate and analyze 3-Φ AC circuits.
			CO 04	Understand the constructional features and operation of 1-Φ transformer.
			CO 05	Illustrate the working principle of 3-Φ machine.
			CO 06	Illustrate the working principle of 1-Φ machines.
6	I	Engineering Physics-I Lab	CO 01	Perform the experiments based on interference in thin films and analyze the results.
			CO 02	Verify the theory learned in the module crystallography.
			CO 03	Perform the experiments on various semiconductor devices and analyze their characteristics.
			CO 04	Students will be able to present Idea and flow of mini project based on literature survey.
7	I	Engineering Chemistry-I Lab	CO 01	Determine Chloride content,COD and hardness of water sample.
			CO 02	Determine free acid pH of different solutions.
			CO 03	Synthesize polymers, biodegradable plastics.
			CO 04	Determine viscosity of oil.
8	I	Engineering Mechanics Lab	CO 01	Verify equations of equilibrium of coplanar force system
			CO 02	Verify law of moments.
			CO 03	Determine the centroid of plane lamina.
			CO 04	Evaluate co-efficient of friction between the different surfaces in contact.
			CO 05	Demonstrate the types of collision/impact and determine corresponding coefficient of restitution.
			CO 06	Differentiate the kinematics and kinetics of a particle.
9	I	Basic Electrical Engineering Lab	CO 01	Interpret and analyse the behaviour of DC circuits using network theorems.
			CO 02	Perform and infer experiment on single phase AC circuits.
			CO 03	Demonstrate experiment on three phase AC circuits.
			CO 04	Illustrate the performance of single phase transformer and machines.
10	I	BSWP-I	CO 01	Interpret the drawings for different geometrical tolerances on the given part ,Use marking tool for marking on given part and Develop the necessary skills required to handle/use different fitting tools for different operation(L3)
			CO 02	Develop skill required for hardware maintenence,Develop skill to install and operating system and system drives and Develop to identify the network components and perform basic networking crimping . (L3)
			CO 03	Develop the necessary skill required to handle/ use different plumbing tools.(L1)

Sr. No	Semester	Course	CO Number	Course Outcome
1	II	Engineering mathematics-II	CO 01	Apply the concepts of First Order and first degree Differential equation to the Problems in the field of engineering.
			CO 02	Apply the concepts of Higher Order Linear Differential equation to the engineering pproblems.
			CO 03	Apply concepts of Beta and Gamma function to solve improper integrals.
			CO 04	Apply concepts of Double integral of different coordinate systems to the engineering problems like area and mass
			CO 05	Apply concepts of triple integral of different coordinate systems to the engineering problems and problems based on volume of solids.
			CO 06	Solve differential equations and integrations numerically using SCILAB software to experimental aspect of applied mathematics.
2	II	Engineering Physics-II	CO 01	Describe the diffraction through slits and its applications.
			CO 02	Apply the foundation of laser and fiber optics in development of modern communication technology.
			CO 03	Relate antenna theory etc.the basics of electrodynamics which is prerequisite for satellite communications,
			CO 04	Explain the fundamentals of relativity.
			CO 05	Assimilate the wide scope of nanotechnology in modern developments and its role in emerging innovating applications.
			CO 06	Interpret and explore basic sensing techniques for physical measurements in modern
3	II	Engineering Chemistry II	CO 01	Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
			CO 02	Illustrate the concept of emission spectroscopy and describe the phenomenon of fluorescence and phosphorescence in relation to it.
			CO 03	Explain the concept of electrode potential and nernst theory and relate it to electrochemical cells.
			CO 04	Identify different types of corrosion and suggest control measures in industries.
			CO 05	Illustrate the principles of green chemistry and study environment impact.
			CO 06	Explain the knowledge of determining the quality of fuel and quantify the oxygen required for combustion of fuel.
4	II	Engineering Graphics	CO 01	Apply the basic principles of projections in Projection of Lines and Planes
			CO 02	Apply the basic principles of projections in Projection of Solids.
			CO 03	Apply the basic principles of sectional views in Section of solids.
			CO 04	Apply the basic principles of projections in converting 3D view to 2D drawing.
			CO 05	Read a given drawing.

Sr. No	Semester	Course	CO Number	Course Outcome
			CO 06	Visualize an object from the given two views.
5	II	C Programming	CO 01	Formulate simple algorithms for arithmetic, logical problems and translate them to programs in C language
			CO 02	Implement, test and execute programs comprising of control structures.
			CO 03	Decompose a problem into functions and synthesize a complete program.
			CO 04	Demonstrate the use of arrays, strings and structures in C language.
			CO 05	Understand the concept of pointers
6	II	Professional Communication and Ethics- I	CO 01	Eliminate barriers and use verbal/non-verbal cues at social and workplace situations.
			CO 02	Employ listening strategies to comprehend wide-ranging vocabulary, grammatical structures, tone and pronunciation.
			CO 03	Prepare effectively for speaking at social, academic and business situations.
			CO 04	Use reading strategies for faster comprehension, summarization and evaluation of texts.
			CO 05	Acquire effective writing skills for drafting academic, business and technical documents.
			CO 06	Successfully interact in all kinds of settings, displaying refined grooming and social skills.
7	II	Engineering Physics-II Lab	CO 01	Perform the experiments based on diffraction through slitsusing Laser source and analyze the results.
			CO 02	Perform the experiments using optical fibre to measure numerical aperture of a given fibre.
			CO 03	Perform the experiments on various sensors and analyze the result.
8	II	Engineering Chemistry-II Lab	CO 01	Determine moisture and ash content of coal.
			CO 02	Determine saponification and acid value of oil
			CO 03	Determine flash point of a lubricating oil.
			CO 04	Synthesize a drug and a biofuel.
			CO 05	Determine Na/K and emf of Cu-Zn sytem.
9	II	Engineering Graphics Lab	CO 01	Apply Basic Principles of projections in projection of lines, Planes, Solids and Section of Solids.
			CO 02	Apply the basic principles of projections in Orthographic Projection and Isometric Projection.
			CO 03	Visualize an object from the given two view..
			CO 04	Apply the basic principles of projections in 2D drawings using a CAD software and the concepts of layers to create drawing.
			CO 05	Create, Annotate, Edit and Plot drawings using basic AutoCAD commands and features.
			CO 06	Apply basic AutoCAD skills to draw different views of a 3D object and to draw the isometric view from the given two views.
			CO 01	Translate given algorithm into program.

Sr. No	Semester	Course	CO Number	Course Outcome
10	II	C Programming Lab	CO 02	Correct syntax errors and logical errors.
			CO 03	Write iterative as well as recursive programs.
			CO 04	Represent data in arrays, strings, structures and manuppulate them through program.
			CO 05	Declare pointers & demonstrate call by refrence concept.
11	II	Professional Communication and Ethics- Lab	CO 01	Listen and comprehend all types of spoken discourse successfully.
			CO 02	Speak fluently and make effective professional presentations.
			CO 03	Read large quantities of text in a short time to comprehend, summarise and evaluate content.
			CO 04	Draft precise business letters, academic essays and technical guidelines.
			CO 05	Dress finely and conduct themselves with panache in social, academic and professional situations.
12	II	Basic Workshop Practice-II	CO 01	Design and model useful prototype such as stool in the carpentry trade
			CO 02	Student able to intrepret the wiring diagrams and perform various basic wiring techniques such as houshold ,staicase,godown,3 phase etc.
			CO 03	Interpret the drawings and model the prototype in sheet metal trade viz.Dustpan

Sr. No	Semester	Course	CO Number	Course Outcome
1	III	Engineering Maths-III	CO 01	Apply the concept of Laplace transform to solve the real integrals.
			CO 02	Apply the concepts of Inverse Laplace transform for various functions and to solve IVP.
			CO 03	Apply knowledge of Fourier series to expand periodic functions into infinite series.
			CO 04	Identify analytic functions& its use to find orthogonal trajectories and apply it to bilinear transformation & conformal mapping.
			CO 05	Apply Matrix algebra to solve the engineering problems.
			CO 06	Solve Partial differential equations by applying numerical solution and analytical methods for one dimensional heat and wave equations
2	III	Strength of Materials	CO 01	Apply fundamental knowledge about various types of loading and stress induced
			CO 02	Draw shear forces and bending moments distribution diagram (SFD and BMD) across the span of the beam.
			CO 03	Analyse the bending stresses induced in beams
			CO 04	Calculate torsional/shear stress in shafts and strain energy for various loading conditions
			CO 05	Solve deflection of beams under various loading condtion and calculate stresses & deformation in thin shells
			CO 06	Analyse buckling and bending phenomena in columns and struts
3	III	Production Processes	CO 01	Demonstrate an understanding of casting process
			CO 02	Illustrate principles of forming processes.
			CO 03	Demonstrate applications of various types of joining processes.
			CO 04	Differentiate chip forming processes such as turning, milling, drilling, etc.
			CO 05	Illustrate principles and working of non-traditional manufacturing
			CO 06	Illustrate the concept of producing polymer components and ceramic components.
			CO 07	Understand the manufacturing technologies enabling Industry 4.0
4	III	Materials and Metallurgy	CO 01	Classify various imperfections in materials and comprehend the effect of these imperfections on deformation
			CO 02	Locate a phase with the help of “major alloying element and temperature” on Fe-Fe3C equilibrium diagram and with the help of “temperature and time” on TTT diagram.
			CO 03	Select appropriate heat treatment process and process parameters for developing specific properties
			CO 04	Express the fatigue and creep failures of material and explain the methods to find fatigue and creep properties of a given material.
			CO 05	Discuss about new materials such as composite materials, nano materials and smart materials for improved performance.
			CO 06	Select an appropriate Non Destructive Testing Method to identify and locate various defects in materials.
			CO 01	Demonstrate application of the laws of thermodynamics to wide range of systems

Sr. No	Semester	Course	CO Number	Course Outcome
5	III	Thermodynamics	CO 02	Compute heat and work interactions in thermodynamics systems
			CO 03	Demonstrate the interrelations between thermodynamic functions to solve practical problems.
			CO 04	Use steam table and mollier chart to compute thermodynamics interactions
			CO 05	Compute efficiencies of heat engines, power cycles etc.
			CO 06	Apply fundamentals of compressible fluid flow to the relevant systems
6	III	Materials Testing	CO 01	Demonstrate the steps for metallographic sample preparation of hardened, annealed, normalized and tempered workpieces and study their microstructure using optical metallurgical microscope (L1,L2)
			CO 02	Identify effects of heat treatment on microstructure of medium carbon steel and hardenability of steel using Jominy end Quench test .
			CO 03	Perform Fatigue test at a given load and locate the number of cycles to failure at that load using rotating bending fatigue tester.
			CO 04	Perform Tension test to Analyze the stress - strain behaviour of materials
			CO 05	Measure torsional strength, hardness and impact resistanceof the materia
			CO 06	Perform flexural test with central and three point loading conditions
			CO 07	Apply fundamental knowledge about various types of loading and stress induced
			CO 08	Draw shear forces and bending moments distribution diagram (SFD and BMD) across the span of the beam.
			CO 09	Analyse the bending stresses induced in beams
			CO 10	Calculate torsional/shear stress in shafts and strain energy for various loading conditions
			CO 11	Solve deflection of beams under various loading condtion and calculate stresses & deformation in thin shells
			CO 12	Analyse buckling and bending phenomena in columns and struts
7	III	Machine Shop Practice	CO 01	Know the specifications, controls and safety measures related to machines and machining operations.
			CO 02	Use the machines for making various engineering jobs.
			CO 03	Perform various machining operations
			CO 04	Perform Tool Grinding
			CO 05	Perform Welding operations
8	III	CAD –Modeling	CO 01	Illustrate basic understanding of types of CAD model creation.
			CO 02	Visualize & prepare 2D modeling of a given object using modeling software.
			CO 03	Build solid model of a given object using 3D modeling software.
			CO 04	Visualize & develop the surface model of a given object using modeling software.
			CO 05	Generate assembly models of given objects using assembly tools of a modeling software.
			CO 06	Perform product data exchange among CAD system

Sr. No	Semester	Course	CO Number	Course Outcome
9	III	Mini Project – 1A	CO 01	Identify problems based on societal /research needs.
			CO 02	Apply Knowledge and skill to solve societal problems in a group.
			CO 03	Develop interpersonal skills to work as member of a group or leader.
			CO 04	Draw the proper inferences from available results through theoretical/ experimental/simulations.
			CO 05	Analyse the impact of solutions in societal and environmental context for sustainable development.
			CO 06	Use standard norms of engineering practices
			CO 07	Excel in written and oral communication.
			CO 08	Demonstrate capabilities of self-learning in a group, which leads to life long learning.
			CO 09	Demonstrate project management principles during project work.
			CO 10	Demonstrate project management principles during project work.

Sr. No	Semester	Course	CO Number	Course Outcome
1	IV	Engineering Maths-IV	CO 01	Apply the concept of Vector calculus to evaluate line integrals, surface integrals using Green's theorem, Stoke's theorem & Gauss Divergence theorem
			CO 02	Apply the concepts of Complex Integration for evaluating integrals, computing residues & evaluating various contour integrals.
			CO 03	Apply the concept of Correlation, Regression, and curve fitting to the engineering problems in data science.
			CO 04	Apply the concepts of Probability and expectations for getting the spread of the data and distribution of probabilities
			CO 05	Apply the concept of probability distribution to solve problems & testing hypothesis of small samples using sampling theory.
			CO 06	Apply the concepts of parametric and nonparametric tests for analysing practical problems
2	IV	Fluid Mechanics	CO 01	Define properties of fluids, classify fluids and evaluate hydrostatic forces on various surfaces.
			CO 02	Illustrate understanding of dimensional analysis of Thermal and Fluid systems.
			CO 03	Differentiate velocity potential function and stream function and solve for velocity and acceleration of a fluid at a given location in a fluid flow.
			CO 04	Formulate and solve equations of the control volume for fluid flow systems and Apply Bernaulli's equation to various flow measuring devices.
			CO 05	Calculate pressure drop in laminar and turbulent flow, evaluate major and minor losses in pipes.
			CO 06	Calculate resistance to flow of incompressible fluids through closed conduits and over surfaces.
3	IV	Kinematics of Machinery	CO 01	Define various components of mechanism
			CO 02	Construct/Compose mechanism to provide specific motion
			CO 03	Draw velocity and acceleration diagram of various mechanism.
			CO 04	Construct CAM profile for the specific follower motion.
			CO 05	Select appropriate power transmission and control mechanism
4	IV	CAD/CAM	CO 01	Identify suitable computer graphics techniques for 3D modeling
			CO 02	UNDERSTAND AND APPLY 2D AND 3D TRANSFORMATION AND DATA STORAGE TECHNIQUES
			CO 03	Develop 3D model using various types of available biomedical data
			CO 04	CALCULATE AND PLAN THE MACNINING OF JOBS ON VARIOUS CNC MACHINES USING VARIOUS PART PROGRAMING LANGUAGES
			CO 05	EXPLAIN THE USE OF RAPID PROTOTYPING AND TOOLING CONCEPTS IN ANY REAL LIFE APPLICATION
			CO 06	Illustrate understanding of various cost effective alternatives for manufacturing products
			CO 01	Illustrate construction, working principles and applications of power electronic switches.

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5	IV	Industrial Electronics	CO 02	Identify rectifiers and inverters for dc and ac motor speed control.
			CO 03	Develop circuits using OPAMP and Timer IC 555.
			CO 04	Identify digital circuits for industrial applications.
			CO 05	Demonstrate the knowledge of basic functioning of microcontrollers.
			CO 06	Analyze speed-torque characteristics of electrical machines for speed control.
6	IV	Industrial Electronics Lab	CO 01	Demonstrate characteristics of various electrical and electronics components
			CO 02	Develop simple applications built around these components
			CO 03	Identify use of different logic gates and their industrial applications
			CO 04	Built and demonstrate parameter measurements using microcontroller
			CO 05	Test and Analyze speed-torque characteristics of electrical machines for speed control.
7	IV	Kinematics of Machinery Lab	CO 01	Draw velocity & acceleration diagarm of verious mechanism.
			CO 02	Construct CAM profile for the specific follower motion.
			CO 03	Select appropriate power transmission & control mechanism.
8	IV	Python Programming	CO 01	Demonstrate understanding of basic concepts of python programming.
			CO 02	Identify, install and utilize python packages
			CO 03	Develop and execute python programs for specific applications
			CO 04	Develop and build python program to solve real-world engineering problems
			CO 05	Prepare a report on case studies selected.
9	IV	CNC and 3-D Printing	CO 01	Develop and execute part programing for any given specific operation
			CO 02	Build any given object using various CNC operations.
			CO 03	Demonstrate CAM Tool path and prepare NC- G code.
			CO 04	Develop 3D model using available biomedical data
			CO 05	Build any given real life object using 3D printing process.
			CO 06	Convert 2D images into 3D model
10	IV	Mini Project – 1B	CO 01	Identify problems based on societal /research needs.
			CO 02	Apply Knowledge and skill to solve societal problems in a group.
			CO 03	Develop interpersonal skills to work as member of a group or leader.
			CO 04	Draw the proper inferences from available results through theoretical/ experimental/simulations.
			CO 05	Analyse the impact of solutions in societal and environmental context for sustainable development.
			CO 06	Use standard norms of engineering practices
			CO 07	Excel in written and oral communication.

Sr. No	Semester	Course	CO Number	Course Outcome
			CO 08	Demonstrate capabilities of self-learning in a group, which leads to life long learning.
			CO 09	Demonstrate project management principles during project work.

Sr. No	Semester	Course	CO Number	Course Outcome
1	V	Mechanical Measurements and Controls	CO 01	Handle, operate and apply the precision measuring instruments / equipment's.
			CO 02	Analyze simple machined components for dimensional stability & functionality.
			CO 03	Classify various types of static characteristics and types of errors occurring in the system.
			CO 04	Classify and select proper measuring instrument for displacement, pressure, flow and temperature measurements.
			CO 05	Design mathematical model of system/process for standard input responses and analyse
			CO 06	Analyse the problems associated with stability.error and differentiate various types of control systems and time domain specifications
2	V	Thermal Engineering	CO 01	Analyze the three modes of heat transfer in engineering application.
			CO 02	Develop mathematical models for different modes of heat transfer.
			CO 03	Analyze performance parameters of different types of heat exchangers.
			CO 04	Identify and analyze the Transient heat Transfer in engineering applications.
			CO 05	Explain construction and working of different components of internal combustion engines.
			CO 06	Evaluate engine performance and emission characteristics.
3	V	Dynamics of Machinery	CO 01	Explain working Principles of different types of governors and Gyroscopic effects on the mechanical systems
			CO 02	Analyse static and dynamic forces in mechanical systems
			CO 03	Determine natural frequency of element/system
			CO 04	Determine vibration response of mechanical elements / systems
			CO 05	Calculate parameters of vibration isolation system for a specific application
			CO 06	Apply concepts of balancing of forces and couples and determine best firing order of an engine
4	V	Finite Element Analysis	CO 01	Solve differential equations using weighted residual methods
			CO 02	Develop the finite element equations to model engineering problems governed by second order differential equations
			CO 03	Apply the basic finite element formulation techniques to solve engineering problems by using one dimensional elements
			CO 04	Apply the basic finite element formulation techniques to solve engineering problems by using two dimensional elements
			CO 05	Apply the basic finite element formulation techniques to find natural frequency of single degree of vibration system
			CO 06	Use commercial FEA software, to solve problems related to mechanical engineering
			CO 01	Identify the types of optimization problems and apply the calculus method to single variable problems.
			CO 02	Formulate the problem as Linear Programming problem and analyse the sensitivity of a decision variable.

Sr. No	Semester	Course	CO Number	Course Outcome
5	V	Optimization Techniques	CO 03	Apply various linear and non-linear techniques for problem solving in various domain.
			CO 04	Apply multi-objective decision-making methods for problem in manufacturing environment and other domain.
			CO 05	Apply multi criterion decision making methods for problem in manufacturing environment and other domain.
			CO 06	Apply Design of Experiments method for Optimization
6	V	Design of Experiments	CO 01	Obtain clear understanding of use of statistics in experimentation
			CO 02	Obtain clear understanding of scheme of experimentation and its effect on accuracy of experimentation
			CO 03	Obtain knowledge of how to analyze results from such investigations to obtain conclusions
			CO 04	Familiar with methodologies that can be used in conjunction with experimental designs for robustness and optimization
			CO 05	Understand strategy in planning and conducting experiments
			CO 06	Choose an appropriate experimentation scheme to evaluate a new product design or process improvement through experimentation strategy, data analysis, and interpretation of experimental results.
7	V	Thermal Engineering Lab	CO 01	Estimate thermal conductivity of engineering materials
			CO 02	Evaluate performance parameters of extended surfaces.
			CO 03	Analyze heat transfer parameters in various engineering applications
			CO 04	Analyze engine performance and emission parameters at different operating conditions.
8	V	Dynamics of Machinery Lab	CO 01	Calcultae and draw performance characteristics of Governors
			CO 02	Analyze gyroscopic effect on laboratory model
			CO 03	Determine natural frequency of mechanical systems
			CO 04	Analyze vibration response of mechanical systems
			CO 05	Determine damping coefficient of a system
9	V	Finite Element Analysis Lab	CO 01	Select appropriate element for given problem
			CO 02	Select suitable meshing and perform convergence test
			CO 03	Select appropriate solver for given problem
			CO 04	Interpret the result
			CO 05	Apply basic aspects of FEA to solve engineering problems
			CO 06	Validate FEA solution
		Professional	CO 01	Plan and prepare effective business/ technical documents which will in turn provide solid foundation for their future managerial roles.
			CO 02	Strategize their personal and professional skills to build a professional image and meet the demands of the industry.

Sr. No	Semester	Course	CO Number	Course Outcome
10	V	Professional communication and ethics –II	CO 03	Emerge successful in group discussions, meetings and result-oriented agreeable solutions in group communication situations.
			CO 04	Deliver persuasive and professional presentations.
			CO 05	Develop creative thinking and interpersonal skills required for effective professional
			CO 06	Apply codes of ethical conduct, personal integrity and norms of organizational behaviour.
11	V	Mini Project – 2 A	CO 01	Identify problems based on societal /research needs.
			CO 02	Apply Knowledge and skill to solve societal problems in a group.
			CO 03	Draw the proper inferences from available results through theoretical/ experimental/simulations.
			CO 04	Analyse the impact of solutions in societal and environmental context for sustainable development
			CO 05	Develop interpersonal skills to work as member of a group or leader
			CO 06	Demonstrate capabilities of self-learning in a group, which leads to life long learning and project management principles during project work.

Sr. No	Semester	Course	CO Number	Course Outcome
1	VI	Machine Design	CO 01	Use design data book/standard codes to standardise the designed dimensions.
			CO 02	Design Knuckle Joint, Cotter joint, Bolted & Welded Joints and Screw Jack
			CO 03	Design shaft under various conditions and couplings.
			CO 04	Select bearings for a given applications from the manufacturers catalogue.
			CO 05	Select and/or design belts and flywheel for given applications
			CO 06	Design springs, clutches and brakes.
2	VI	Turbo Machinery	CO 01	Define various parameters associated with steam generators and turbo machines.
			CO 02	Identify various components and mountings of steam generators with their significance.
			CO 03	Identify various turbo machines and explain their significance.
			CO 04	Apply principles of thermodynamics and fluid mechanics to estimate various parameters like mass flow rate power, torque, efficiency, temperature, etc.
			CO 05	Evaluate performance of SG and Turbo machines and apply various techniques to enhance performance
			CO 06	Evaluate various phenomena related to performance like cavitation, choking, surging.
3	VI	Heating, Ventilation, Air conditioning and Refrigeration	CO 01	Demonstrate fundamental principles of HVAC&R
			CO 02	Identify & Locate various components of HVAC&R system
			CO 03	Illustrate various refrigeration and air conditioning processes using psychometric chart
			CO 04	Evaluate performance of various refrigeration system
			CO 05	Calculate cooling and heating loads for an airconditioning system
			CO 06	Select air handling unit & design air distribution syste
4	VI	Automation and Artificial Intelligence	CO 01	Demonstrate understanding of fundamentals of industrial automation and AI.
			CO 02	Design & develop pneumatic / hydraulic circuits.
			CO 03	Design and develop electropneumatic circuits and PLC ladder logics.
			CO 04	Demonstrate understanding of robotic control systems and their applications.
			CO 05	Demonstrate understanding of various AI and machine learning technologies.
5	VI	Metal Forming Technology	CO 01	Relate the metallographic aspects of materials with the metal forming processes
			CO 02	Classify, calculate loads and identify defects in Metal Rolling process
			CO 03	Classify, calculate loads and identify defects in Metal Forging process.
			CO 04	Classify and calculate loads in Metal Extrusion process.
			CO 05	Classify and calculate loads in Metal Drawing process
			CO 06	Classify and Describe various sheet metal forming processes and their applications.

Sr. No	Semester	Course	CO Number	Course Outcome
6	VI	Machine Design Lab	CO 01	Use design data book/standard codes to standardise the designed dimensions.
			CO 02	Design Knuckle Joint, Cotter joint, Bolted & Welded Joints and Screw Jack
			CO 03	Design shaft under various conditions and couplings.
			CO 04	Select bearings for a given applications from the manufacturers catalogue.
			CO 05	Select and/or design belts and flywheel for given applications.
			CO 06	Design springs, clutches and brakes.
			CO 07	Course Project: Design in a Group, a system of minimum 5 components and/or Analysis it using software and prepare a Course Project Report.
7	VI	Turbo Machinery Lab	CO 01	Differentiate boiler, boiler mountings and accessories
			CO 02	Conduct a trial on reciprocating compressor / centrifugal compressor.
			CO 03	Conduct a trial on impulse turbine and analyze its performance
			CO 04	Conduct a trail on reaction turbine and analyze its performance
			CO 05	Conduct a trial on Centrifugal pump and analyze its performance
			CO 06	Conduct a trial on Reciprocating pump and analyze its performance
8	VI	Heating, Ventilation, Air conditioning and Refrigeration Lab	CO 01	Demonstrate fundamental principles of HVAC&R
			CO 02	Identify & Locate various components of HVAC&R system
			CO 03	Illustrate various refrigeration and air conditioning processes using psychometric chart
			CO 04	Evaluate performance of various refrigeration system
			CO 05	Operate and maintain refrigeration system
			CO 06	Operate and maintain air conditioning system
9	VI	Measurements and Automation Lab	CO 01	Use inspection gauges to check or measure surface parameters such as linear and angular dimensions.
			CO 02	Use precision measurement tools and equipments such as Vernier Caliper and micrometer screw Gauge for measurement of surface parameters.
			CO 03	Use sensors for measurement of different mechanical parameters such as Pressure, Strain, vibration etc.
			CO 04	Analyse the response of a control systems for different type of inputs.
			CO 05	Analyse the response of a control systems for different type of inputs.
			CO 06	Prepare program on PLC system to demonstrate a specific application such as On-Off control, counter, motor control etc.
			CO 01	Identify problems based on societal /research needs.
			CO 02	Apply Knowledge and skill to solve societal problems in a group.

Sr. No	Semester	Course	CO Number	Course Outcome
10	VI	Mini Project - 2B	CO 03	Develop interpersonal skills to work as member of a group or leader.
			CO 04	Draw the proper inferences from available results through theoretical/ experimental/simulations.
			CO 05	Analyse the impact of solutions in societal and environmental context for sustainable development.
			CO 06	Use standard norms of engineering practices
			CO 07	Excel in written and oral communication.
			CO 08	Demonstrate capabilities of self-learning in a group, which leads to life long learning.
			CO 09	Demonstrate project management principles during project work.

Sr. No	Semester	Course	CO Number	Course Outcome
1	VII	Design of Mechanical System	CO 01	Apply the concept of system design.
			CO 02	Select appropriate gears for power transmission on the basis of given load and speed.
			CO 03	Design of hoisting mechanism of EOT crane.
			CO 04	Design belt conveyor systems.
			CO 05	Design engine components such as cylinder, piston, connecting rod and crankshaft.
			CO 06	Design pump for the given application.
2	VII	Logistics and Supply Chain Management	CO 01	Demonstrate a sound understanding of Logistics and Supply Chain Management concepts and their role in today's business environment.
			CO 02	Identify the drivers of Supply Chain Performance and risks in Supply Chain Management.
			CO 03	Apply various techniques of inventory management and rank the items using inventory management techniques.
			CO 04	Apply various strategises and techniques to minimise the overall logistics cost.
			CO 05	Understand the role of digitization in Supply Chain Management leading to sustainability.
			CO 06	Apply various mathematical models/tools to design the Supply Chain Network.
3	VII	Renewable Energy Systems	CO 01	Describe the need for renewable energy and its potential
			CO 02	Analyze different solar collector using geometrical parameters photovoltaic for generation of solar energy
			CO 03	Identify and analyze various wind turbine energy harnesment techniques
			CO 04	Design biogas plant for hrnessing energy from organic waste
			CO 05	Describe significance of hydrogen energy to fulfill present and future energy needs
			CO 06	Describe the operating principal of geothermal energy and ocen energy and their role in sustainable development
4	VII	Vibration Controls	CO 01	Apply basic concepts of Vibration Isolation and Damping.
			CO 02	Identify suitable Vibration Absorber
			CO 03	Identify suitable Vibration Isolator
			CO 04	Apply suitable method to Control the vibrations to the acceptable level.
5	VII	Operation Research	CO 01	Uunderstand the application of OR and frame a LP Problem with solution
			CO 02	Solve Transportation and Assignment problems using appropriate method
			CO 03	Solve and take best course of action out of several alternative courses for the purpose of achieving objectives by applying game theory , Queuing Theory and Simulation Techniques
			CO 04	Solve decison making problems by using Dynamic Programming Method
			CO 05	Formulate a mathematical model describing the behavior of the inventory system and decide on optimum inventory policy

Sr. No	Semester	Course	CO Number	Course Outcome
6	VII	Design of Mechanical System Lab	CO 01	Apply the concept of system design.
			CO 02	Select appropriate gears for power transmission on the basis of given load and speed.
			CO 03	Design material handling systems such as hoisting mechanism of EOT crane.
			CO 04	Design belt conveyor systems.
			CO 05	Design engine components such as cylinder, piston, connecting rod and crankshaft.
			CO 06	Design pumps for the given applications.
			CO7	Design & Preparation of working Drawings of any system using software like, python, VB, C++, Excel etc for mechanical Systems.
7	VII	Maintenance Engineering Lab	CO 01	Identify different tools.
			CO 02	Apply different maintenance strategies.
			CO 03	Demonstrate the process of servicing a machine.
			CO 04	Identify common faults in Machinery using Vibration Spectrum.
			CO 05	Interpret the Vibration Signals for Monitoring and Prognosis.
8	VII	Industrial Soft Skills Lab	CO 01	Skilfully prepare and edit documents and slides on MS Word and MS PowerPoint etc.
			CO 02	Execute functions on MS Excel.
			CO 03	Learn how to navigate tasks and execute functions in G-suite and Latex
			CO 04	Develop awareness about general workplace behavior and build interpersonal and team skills.
			CO 05	Understand and practice metacognitive skillsof creativity and problem solving.
			CO 06	Perform well in campus placement rounds by practising Aptitude, Logical reasoning, Group Discussion and Personal Interviews.
9	VII	Major Project 1	CO 01	Develop the understanding of the problem domain through extensive review of literature.
			CO 02	Identify and analyze the problem in detail to define its scope with problem specific data.
			CO 03	Identify various techniques to be implemented for the selected problem and related technical skills through feasibility analysis.
			CO 04	Design solutions for real-time problems that will positively impact society and environment..
			CO 05	Develop clarity of presentation based on communication, teamwork and leadership skills.
			CO 06	Inculcate professional and ethical behavior..

Sr. No	Semester	Course	CO Number	Course Outcome
1	VIII	Operations Planning and Control	CO 01	Illustrate operations functions and manage operations in a better way.
			CO 02	Apply various strategies to develop aggregate production plans based on demand forecasting.
			CO 03	Apply various algorithms in scheduling and sequencing of manufacturing and service operations.
			CO 04	Develop Material Requirement Plans (MRPs) to estimate the planned order releases.
			CO 05	Apply various techniques for facility layout planning and line balancing to optimize the resources.
			CO 06	Demonstrate the importance of implementation of JIT, Lean, Agile and Synchronous manufacturing in manufacturing and service organizations.
2	VIII	Smart Materials	CO 01	Classify and select different types of smart materials
			CO 02	Comprehend Important Concepts and principles of Smart Materials
			CO 03	synthesis, sensing and actuation of Piezoelectric Materials, Magneto strictive Materials, Shape Memory Alloys, Electroactive Polymers
			CO 04	synthesis, sensing and actuation of Ferrofluids and Magneto rheological Fluids, Soft Matter,Carbon Nanotubes and Carbon nanostructures, Thermoelectric Materials
			CO 05	Classify and select Smart Materials for Energy Applications: Materials used for energy storage
			CO 06	Classify and select Composite Materials, Nano Composite Materials
3	VIII	Product Design and Development	CO 01	Describe the process of product design & development.
			CO 02	Employ engineering, scientific, and mathematical principles to develop and execute a design project from a concept to a finished product.
			CO 03	Create 3D solid models of mechanical components using CAD software.
			CO 04	Demonstrate individual skills using selected manufacturing techniques such as rapid prototyping.
			CO 05	Fabricate an electromechanical assembly of a product from engineering drawings.
			CO 06	Work collaboratively in a team to complete a design project.
			CO 07	Effectively communicate the results of projects and other assignments both in a written and oral format.
4	VIII	Environment Management	CO 01	Understand the environment and its significance.
			CO 02	Understand ecosystem and interdependence, food chain, etc.
			CO 03	Understand the concept of Ecology.
			CO 04	Understand the concept of environmental management system.
			CO 05	Understand the concept of Environmental Certifications
			CO 06	Understand the Environmental Management Legislations

Sr. No	Semester	Course	CO Number	Course Outcome
5	VIII	Product Design and Development Lab	CO 01	Identify the need for developing products
			CO 02	Select suitable PD&D processes
			CO 03	Apply the creativity & industrial design methods to design & develop the chosen product
			CO 04	Work collaboratively in a team to complete a PD&D project.
			CO 05	Effectively communicate the results of projects and other assignments both in a written and oral format.
6	VIII	Laboratory based on IoT	CO 01	Develop simple applications using microcontrollers 8051 and Arduino
			CO 02	Interface simple peripheral devices to a Microcontroller
			CO 03	Use microcontroller based embedded platforms in IoT
			CO 04	Use wireless peripherals for exchange of data
			CO 05	Setup cloud platform and log sensor data
7	VIII	Major Project II	CO 01	Implement solutions for the selected problem by applying technical and professional skills.
			CO 02	Analyze impact of solutions in societal and environmental context for sustainable development.
			CO 03	Collaborate best practices along with effective use of modern tools.
			CO 04	Develop proficiency in oral and written communication with effective leadership and teamwork.
			CO 05	Nurture professional and ethical behavior.
			CO 06	Gain expertise that helps in building lifelong learning experience.