Department: - Mechanical **Year : SE Sem 1**

Course Title: Solid Mechanics **2019 Pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DEFINE** various types of stresses and strain developed on determinate and indeterminate members.
CO2	**DRAW** Shear force and bending moment diagram for various types of transverse loading and support.
CO3	**COMPUTE** the slope & deflection, bending stresses and shear stresses on a beam.
CO4	**CALCULATE** torsional shear stress in shaft and buckling on the column.
CO5	**APPLY** the concept of principal stresses and theories of failure to determine stresses on a 2-D element.
CO6	**UTILIZE** the concepts of SFD & BMD, torsion and principal stresses to solve combined loading application based problems.

Department: Mechanical **Year :SE Sem 1**

Course Title: Solid Modeling and Drafting **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**UNDERSTAND** basic concepts of CAD system, need and scope in Product Lifecycle Management.
CO2	**UTILIZE** knowledge of curves and surfacing features and methods to create complex solid geometry
CO3	**CONSTRUCT** solid models, assemblies using various modeling techniques & PERFORM mass property analysis, including creating and using a coordinate system
CO4	**APPLY** geometric transformations to simple 2D geometries
CO5	**USE** CAD model data for various CAD based engineering applications viz. production drawings, 3D printing, FEA, CFD, MBD, CAE, CAM, etc.
CO6	**USE** PMI & MBD approach for communication

Department: Mechanical **Year :SE Sem 1**

Course Title: Engineering Thermodynamics **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DESCRIBE** the basics of thermodynamics with heat and work interactions.
CO2	**APPLY** laws of thermodynamics to steady flow and non-flow processes.
CO3	**APPLY** entropy, available and non available energy for an Open and Closed System.
CO4	**DETERMINE** the properties of steam and their effect on performance of vapour power cycle.
CO5	**ANALYSE** the fuel combustion process and products of combustion.
CO6	**SELECT** various instrumentations required for safe and efficient operation of steam generator.

Department: Mechanical **Year :SE Sem 1**

Course Title: Engineering Materials and Metallurgy **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**COMPARE** crystal structures and ASSESS different lattice parameters.
CO2	**CORRELATE** crystal structures and imperfections in crystals with mechanical behaviour of materials.
CO3	**DIFFERENTIATE** and **DETERMINE** mechanical properties using destructive and non-destructive testing of materials.
CO4	**IDENTIFY** & **ESTIMATE** different parameters of the system viz., phases, variables, component, grains, grain boundary, and degree of freedom. etc.
CO5	**ANALYSE** effect of alloying element & heat treatment on properties of ferrous & nonferrous alloy.
CO6	**SELECT** appropriate materials for various applications.

Department: Mechanical **Year :SE Sem 1**

Course Title: Electrical and Electronics Engineering **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**APPLY** programming concepts to UNDERSTAND role of Microprocessor and Microcontroller in embedded systems
CO2	**DEVELOP** interfacing of different types of sensors and other hardware devices with Atmega328 based Arduino Board
CO3	**UNDERSTAND** the operation of DC motor, its speed control methods and braking
CO4	**DISTINGUISH** between types of three phase induction motor and its characteristic features
CO5	**EXPLAIN** about emerging technology of Electric Vehicle (EV) and its modular subsystems
CO6	**CHOOSE** energy storage devices and electrical drives for EVs

Department: Mechanical **Year :SE Sem 1**

Course Title: Geometric Dimensioning and Tolerancing Lab **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**SELECT** appropriate IS and ASME standards for drawing
CO2	**READ** & **ANALYSE** variety of industrial drawings
CO3	**APPLY** geometric and dimensional tolerance, surface finish symbols in drawing
CO4	**EVALUATE** dimensional tolerance based on type of fit, etc.
CO5	**SELECT** an appropriate manufacturing process using DFM, DFA, etc.

Department: - Mechanical **Year : SE Sem 2**

Course Title: Engineering Mathematics - III **2019 Pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**SOLVE** higher order linear differential equations and its applications to model and analyze mass spring systems.
CO2	**APPLY** Integral transform techniques such as Laplace transform and Fourier transform to solve differential equations involved in vibration theory, heat transfer and related mechanical engineering applications.
CO3	**APPLY** Statistical methods like correlation, regression in analyzing and interpreting experimental data applicable to reliability engineering and probability theory in testing and quality control.
CO4	**PERFORM** Vector differentiation & integration, analyze the vector fields and APPLY to fluid flow problems.
CO5	**SOLVE** Partial differential equations such as wave equation, one and two dimensional heat flow equations.

Department: Mechanical **Year :SE Sem 2**

Course Title: Kinematics of Machinery **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**APPLY** kinematic analysis to simple mechanisms
CO2	**ANALYZE** velocity and acceleration in mechanisms by vector and graphical method
CO3	**SYNTHESIZE** a four bar mechanism with analytical and graphical methods
CO4	**APPLY** fundamentals of gear theory as a prerequisite for gear design
CO5	**CONSTRUCT** cam profile for given follower motion

Department: Mechanical **Year :SE Sem 2**

Course Title: Applied Thermodynamics **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DETERMINE** COP of refrigeration system and **ANALYZE** psychrometric processes.
CO2	**DISCUSS** basics of engine terminology,air standard, fuel air and actual cycles.
CO3	**IDENTIFY** factors affecting the combustion performance of SI and CI engines.
CO4	**DETERMINE** performance parameters of IC Engines and emission control.
CO5	**EXPLAIN** working of various IC Engine systems and use of alternative fuels.
CO6	**CALCULATE** performance of single and multi stage reciprocating compressors and **DISCUSS** rotary positive displacement compressors

Department: Mechanical **Year :SE Sem 2**

Course Title: Fluid Mechanics **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DETERMINE** various properties of fluid
CO2	**APPLY** the laws of fluid statics and concepts of buoyancy
CO3	**IDENTIFY** types of fluid flow and terms associated in fluid kinematics
CO4	**APPLY** principles of fluid dynamics to laminar flow
CO5	**ESTIMATE** friction and minor losses in internal flows and DETERMINE boundary layer formation over an external surface
CO6	**CONSTRUCT** mathematical correlation considering dimensionless parameters, also **ABLE** to predict the performance of prototype using model laws

Department: Mechanical **Year :SE Sem 2**

Course Title: Manufacturing Processes **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**SELECT** appropriate moulding, core making and melting practice and estimate pouring time, solidification rate and DESIGN riser size and location for sand casting process
CO2	**UNDERSTAND** mechanism of metal forming techniques and CALCULATE load required for flat rolling
CO3	**DEMONSTRATE** press working operations and APPLY the basic principles to **DESIGN** dies and tools for forming and shearing operations
CO4	**CLASSIFY** and **EXPLAIN** different welding processes and **EVALUATE** welding characteristics
CO5	**DIFFERENTIATE** thermoplastics and thermosetting and EXPLAIN polymer processing techniques
CO6	**UNDERSTAND** the principle of manufacturing of fibre-reinforce composites and metal matrix composites

Department: Mechanical **Year :SE Sem 2**

Course Title: Machine Shop **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**PERFORM** welding using TIG/ MIG/ Resistance/Gas welding technique
CO2	**MAKE** Fibre-reinforced Composites by hand lay-up process or spray lay-up techniques
CO3	**PERFORM** cylindrical/surface grinding operation and **CALCULATE** its machining time
CO4	**DETERMINE** number of indexing movements required and acquire skills to **PRODUCE** a spur gear on a horizontal milling machine
CO5	**PREPARE** industry visit report
CO6	**UNDERSTAND** procedure of plastic processing

Department: - Mechanical **Year : TE Sem 1**

Course Title: Numerical and Statistical Methods **2019 Pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**SOLVE** system of equations using direct and iterative numerical methods.
CO2	**ESTIMATE** solutions for differential equations using numerical techniques.
CO3	**DEVELOP** solution for engineering applications with numerical integration.
CO4	**DESIGN** and **CREATE** a model using a curve fitting and regression analysis.
CO5	**APPLY** statistical Technique for quantitative data analysis.
CO6	**DEMONSTRATE** the data, using the concepts of probability and linear algebra.

Department: Mechanical **Year :TE Sem 1**

Course Title: Heat and Mass Transfer **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**ANALYZE** & **APPLY** the modes of heat transfer equations for one dimensional thermal system.
CO2	**DESIGN a** thermal system considering fins, thermal insulation and & Transient heat conduction.
CO3	**EVALUATE** the heat transfer rate in natural and forced convection & validate with experimentation results.
CO4	**INTERPRET** heat transfer by radiation between objects with simple geometries, for black and grey surfaces.
CO5	**ABILITY** to analyze the rate of mass transfer using Fick's Law of Diffusion and understands mass diffusion in different coordinate systems.
CO6	**DESIGN & ANALYSIS** of heat transfer equipments and investigation of its performance.

Department: Mechanical **Year :TE Sem 1**

Course Title: Design of Machine Elements **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DESIGN AND ANALYZE** the cotter and knuckle Joints, levers and components subjected to eccentric loading.
CO2	**DESIGN** shafts, keys and couplings under static loading conditions.
CO3	**ANALYZE** different stresses in power screws and APPLY those in the procedure to design screw jack.
CO4	**EVALUATE** dimensions of machine components under fluctuating loads.
CO5	**EVALUATE** & **INTERPRET** the stress developed on the different type of welded and threaded joints.
CO6	**APPLY** the design and development procedure for different types of springs.

Department: Mechanical **Year :TE Sem 1**

Course Title: Mechatronics **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**DEFINE** key elements of mechatronics, principle of sensor and its characteristics.
CO2	**UTILIZE** concept of signal processing and **MAKE** use of interfacing systems such as ADC, DAC, Digital I/O.
CO3	**DETERMINE** the transfer function by using block diagram reduction technique.
CO4	**EVALUATE** Poles and Zero, frequency domain parameter for mathematical modeling for mechanical system.
CO5	**APPLY** the concept of different controller modes to an industrial application.
CO6	**DEVELOP** the ladder programming for industrial application.

Department: Mechanical **Year :TE Sem 1**

Course Title: Digital Manufacturing Laboratory **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**DEVELOP** a component using conventional machines, CNC machines and Additive Manufacturing Techniques.
CO2	**ANALYZE** cutting tool parameters for machining given job.
CO3	**DEMONSTRATE** simulation of manufacturing process using Digital Manufacturing Tools.
CO4	**SELECT** and **DESIGN** jigs and Fixtures for a given component.
CO5	**DEMONSTRATE** different parameters for CNC retrofitting and reconditioning.

Department: Mechanical **Year :TE Sem 1**

Course Title: Skill Development **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**APPLY**& **DEMONSTRATE** procedure of assembly & disassembly of various machines.
CO2	**DESIGN & DEVELOP** a working/model of machine parts or any new product.
CO3	**EVALUATE** fault with diagnosis on the machines, machine tools and home appliances.
CO4	**IDENTIFY** & **DEMONSTRATE** the various activities performed in an industry such as maintenance, design of components, material selection.

Department: Mechanical **Year :TE Sem 1**

Course Title: Internship/Mini project **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**ANALYSE** the effect of friction in metal forming deep drawing and IDENTIFICATION of surface defects and their remedies in deep drawing operations
CO2	**ASSESS** the parameters for special forming operation and SELECT appropriate special forming operation for particular applications
CO3	**ANALYSE** the effect of HAZ on microstructure and mechanical properties of materials
CO4	**CLASSIFY** various solid state welding process and **SELECT** suitable welding processes for particular applications
CO5	**CLASSIFY** various advanced welding process and **SELECT** suitable welding processes for particular applications.
CO6	**INTERPRET** the principles of sustainable manufacturing and its role in manufacturing industry.

Department: - Mechanical **Year : TE Sem 2**

Course Title: Design of Transmission Systems **2019 Pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**APPLY** the principle of Spur & Helical gear design for industrial application and PREPARE a manufacturing drawing with the concepts of GD&T.
CO2	**EXPLAIN** and **DESIGN** Bevel & Worm gear considering design parameters as per design standards.
CO3	**SELECT&DESIGN** Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters.
CO4	**DEFINE** and **DESIGN** various types of Clutches, Brakes, used in automobile.
CO5	**APPLY** various concept to **DESIGN** Machine Tool Gear box, for different applications
CO6	**ELABORATE** various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles.

Department: Mechanical **Year :TE Sem 2**

Course Title: Artificial Intelligence & Machine Learning **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**Explain**fundamentals of artificial intelligence and machine learning
CO2	**Apply**feature extraction and selection techniques for processing data.
CO3	**Apply** machine learning algorithms for classification and regression problems
CO4	**Understand**steps involved in development of machine learning model &**Evaluate** performance of Machine Learning Model.
CO5	**Explain** concepts of reinforced and deep learning
CO6	**Simulate** machine learning model in mechanical engineering problems

Department: Mechanical **Year :TE Sem 2**

Course Title: Computer Aided Engineering **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**UNDERSTAND** the basic concepts of Computer Aided Engineering (CAE) and **CHARACTERISTICS** of various elements required for analysis.
CO2	**NURTURE** students about the discretization process and criteria for quality mesh.
CO3	**UNDERSTAND** the approaches of Finite Element Method (FEM) and to find displacement and stresses over the body.
CO4	**DEVELOP** the knowledge and skills needed to effectively evaluate the results using Finite Element Analysis (FEA).
CO5	**APPLY** computational technique to solve complex solid mechanics problems and its loading states.
CO6	**STUDY** the applications of CAE in the various domains of the Mechanical Engineering.

Department: Mechanical **Year :TE Sem 2**

Course Title: Elective II- Composite Materials **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**DEFINE & COMPARE** composites with traditional materials
CO2	**IDENTIFY & ESTIMATE** different parameters of the Polymer Matrix Composite
CO3	**CATEGORISE** and **APPLY** Metal Matrix Process from possessions landscape.
CO4	**DETERMINE** volume/weight fraction and strength of Composites.
CO5	**SELECT** appropriate testing and inspection method for composite materials.
CO6	**SELECT** composites materials for various applications.

Department: Mechanical **Year :TE Sem 2**

Course Title: Measurement Laboratory **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement At the end of the course, student will be able to
CO1	**EVALUATE** causes of errors in Vernier calipers, micrometers by performing experiments in standard metrological conditions, noting deviations at actual and by plotting cause and effect diagram, to reduce uncertainty in measurement.
CO2	**ANALYZE** strain measurement parameters by taking modulus of elasticity in consideration to acknowledge its usage in failure detection and force variations.
CO3	**EXAMINE** surface Textures, surface finish using equipment's like Talysurf and analyze surface finish requirements of metrological equipment's like gauges, jaws of vernier calipers, micrometers, magnifying glasses of height gauge and more, to optimize surface finish accuracy requirements and cost of measurement.
CO4	**MEASURE** the dimensional accuracy using Comparator and limit gauges and appraise their usage in actual measurement or comparison with standards set to reduce measurement lead time.
CO5	**PERFORM** Testing of Flow rate, speed and temperature measurements and their effect on performance in machines and mechanisms like hydraulic or pneumatic trainers, lathe machine etc. to increase repeatability and reproducibility.
CO6	**COMPILE** the information of opportunities of entrepreneurships/business in various sectors of metrology like calibrations, testing, coordinate and laser metrology etc in an industry visit report.

Department: Mechanical **Year :TE Sem 2**

Course Title: Fluid Power & Control Laboratory **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**DEFINE** working principle of components used in hydraulic and pneumatic systems.
CO2	**IDENTIFY & EXPLAIN** various applications of hydraulic and pneumatic systems.
CO3	**SELECT** an appropriate component required for hydraulic and pneumatic systems using manufactures' catalogues. \
CO4	**SIMULATE & ANALYSE** various hydraulic and pneumatic systems for industrial/mobile applications.
CO5	**DESIGN** a hydraulic and pneumatic system for the industrial applications.
CO6	**DESIGN & DEMNSTRATE** various IoT, PLC based controlling system using hydraulics and pneumatics.

Department: Mechanical **Year :TE Sem 2**

Course Title: Internship/Mini project **2019 pattern**

Course Outcomes (CO):

Course outcome (CO)	Statement
	At the end of the course, student will be able to
CO1	**DEMONSTRATE** professional competence through industry internship.
CO2	**APPLY** knowledge gained through internships to complete academic activities in a professional manner.
CO3	**CHOOSE** appropriate technology and tools to solve given problem.
CO4	**DEMONSTRATE** abilities of a responsible professional and use ethical practices in day to day life.
CO5	**DEVELOP** network and social circle, and **DEVELOPING** relationships with industry people.
CO6	**ANALYZE** various career opportunities and **DECIDE** career goals.