Department	Mechanical Engineering
Course Code	HU 101
Title of Course	English Language and Technical Communication
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	2L + 0T
Total Contact Hours	25
Course Out Come	CO1: Ability to Communicate technical matters CO2: Ability to Communicate fluently and confidently on all spheres of everyday matters.

Department	Mechanical Engineering
Course Code	PH-101
Title of Course	Physics-I
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L + 1T
Total Contact Hours	42
Course Out Come	**CO1:** Ability to understand the general property of matters and the Oscillation property. **CO2:** Ability to know optics property. **CO3:** Ability to learn basics of Quantum Physics **CO4:** Ability to understand Crystallography and get the idea of crystal structure and understand the property and behaviour of X-Ray.

Department	Mechanical Engineering
Course Code	M-101
Title of Course	Mathematics-I
Nature of Course	Compulsory
Type of Course	Lecture

Contact Hours	3L + 1T
Total Contact Hours	40
Course Out Come	**CO1:** Ability to explain the Knowledge of Matrix, Eigen value problems. **CO2:** Ability to determine the solutions for differential equations which are useful in the Study of Circuit theory and oscillatory systems. **CO3:** Ability to understand Calculus of Functions of Several Variables Partial derivatives, Total differential equations for Electro- magnetic theory, Transmission lines and Vibrating membranes. **CO4:** Ability to use the convergence and Divergence of infinite series in the study ofcommunication systems. **CO5:** Ability to understand Vector Algebra and Vector Calculus.

Department	Mechanical Engineering
Course Code	ES101
Title of Course	Basic Electrical & Electronic Engineering – I
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L+1T
Total Contact Hours	48
Course Out Come	**CO1:** Ability to explain the fundamentals of Physics. **CO2:** Ability to explain the basic knowledge of Electrical and Electronics Engineering. **CO3:** Ability to apply DC network theorem and Kirchhoff's law on different electrical circuits. **CO4:** Ability to determine AC fundamentals like generation of ac voltages, waveforms, average and RMS values, peak factor, form factor, series and parallel resonance circuits. **CO5:** Ability to explain principles of electromagnetism and associated laws. **CO6:** Ability to identify various semiconductors and ability to design and analyse different electrical circuits using different semiconductors.

Department	Mechanical Engineering
Course Code	ME 101
Title of Course	Engineering Mechanics
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4L
Total Contact Hours	48

Course Outcomes	ME101.1: To **acquire** fundamental knowledge in Engineering Mechanics concepts. ME101.2: To **Understand** and **Apply** free body diagrams to calculate the reactions necessary to ensure static equilibrium. ME101.3: To **Identify** and **Analyze** various forces associated with a static frame work. ME101.4: To **Apply** and **Analyze** problems associated with frictional forces. Centre of gravity and moment of inertia. ME101.5: To **Understand** and **Apply** basic concepts of stress and strain in solids to solve related problems. ME101.6: To **Describe** the motion of a particle in terms of its position, velocity and acceleration in different frames of reference and to **Analyze** the forces causing the motion of a particle.

Department	Mechanical Engineering
Course Code	PH-191
Title of Course	Physics Practical-I
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	30
Course Out Come	**CO1:** Ability to understand the general property of matters like viscosity, Young's Modulus and Modulus of Rigidity **CO2:** Ability to know optical property. **CO3:** Ability to learn electrical property. **CO4:** Ability to understand thermal conductivity

Department	Mechanical Engineering
Course Code	ES191
Title of Course	Basic Electrical & Electronic Engineering – 1
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Out Come	**CO1:** Ability to perform different experiments of Basic Electrical and Electronics Engineering. **CO2:** Ability to perform different experiments to verify network theorems.

Department	Mechanical Engineering
Course Code	ME 192
Title of Course	Workshop Practice

Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Outcomes	CO1: **Concept**of Engineering materials and its physical, chemical and mechanical properties & applications. CO2: **Understand** different conventional manufacturing processes mainly covering basic principles, different methods and general applications. CO3: **Basic Concept** of forming/shapingand casting. CO4: **Understanding** various aspects of welding processes and its applications. CO5: **Practices** of elementary machining operations- Facing, Centering, Turning, Threading, Drilling, Boring, Shaping and Milling.

Department	Mechanical Engineering
Course Code	HU 181
Title of Course	Language Laboratory
Nature of Course	Compulsory
Type of Course	Sessional
Contact Hours	2P
Total Contact Hours	19
Course Out Come	CO1: Ability to develop skills of technical communication in English through Language Lab practice sessions. CO2: Ability to Communicate confidently and competently in English in all spheres.

Department	Mechanical Engineering
Course Code	XC 181
Title of Course	Extra Curricular Activities(NSS/NCC/NSO)
Nature of Course	Compulsory
Type of Course	Sessional
Contact Hours	2P
Total Contact Hours	19
Course Out Come	CO1: Ability to develop character, discipline, leadership, the spirit of adventure and the ideals of selfless service among the youth of the Nation. CO2: To instill in the cadets a sense of adventure, team work and discipline through its various Adventure

Department	Mechanical Engineering
Course Code	CS201
Title of Course	Basic Computation & Principles of Computer Programming
Nature of Course	Compulsory
Type of Course	Lecture

Contact Hours	L + T= 3+1
Total Contact Hours	48
Course Out Come	**CO1:** To recall, recognize and relate the History and different Generations of Computers; Classify the Computers; describe the Basic Anatomy of Computer Systems including Primary & Secondary Memory, Processing Unit and I/O devices. **CO2:** To define and accordingly apply the Binary & Allied number systems including signed and unsigned numbers; Demonstrate, discriminate and justify the concepts of BCD & ASCII, Binary Arithmetic & logic gates. **CO3:** To explain the basic concepts of computer programming; Represent real life problems in terms of C programs and accordingly solve them. **CO4:** To write C programs for developing basic applications viz. inventory management system, billing systems etc. and basic games viz. snakeladder, tick-tack-toe etc. **CO5:** To illustrate some system level programming like batch programming, registry programming etc.

Department	Mechanical Engineering
Course Code	CH-201
Title of Course	Chemistry-1
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	L + T= 3+1
Total Contact Hours	42
Course Out Come	**CO1**: Ability to apply concept of Chemical Thermodynamic system with associated laws. **CO2**: Ability to understand Reaction Dynamics & Solid state Chemistry for detection ofdefects in metals and role of semiconductor. **CO3**: Ability to understand Electrochemistry, Structure and reactivity of Organic molecule **CO4**: Ability to understand the Industrial Chemistry and its applicability. CO5: List major chemical reactions that are used in the synthesis of molecules.

Department	Mechanical Engineering
Course Code	M-201
Title of Course	Mathematics-II
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L + 1T
Total Contact Hours	40
Course Out Come	**CO1:** Ability to learn Ordinary differential equations with higher order and first degree. **CO2:** Ability to learn Basics of Graph Theory which are useful in the Study of Circuit theory. **CO3:** Ability to learn Laplace Transform which is useful in the study of communicationsystems.

Department	Mechanical Engineering
Course Code	ES201
Title of Course	Basic Electrical & Electronic Engineering – II
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L+1T
Total Contact Hours	48
Course Out Come	**CO1:** Ability to explain electrical properties and simple electrical devices. **CO2:** Ability to explain construction and mechanism of working of different DC machine, 1-phase transformer and 3-phase induction motor. **CO3:** Ability to understand the basic concepts of 3-phase system and structure of power system. **CO4:** Students must acquire to express binary numbers, convert binary to decimal and vice-versa, draw truth table of various applications, design gates and simple digital circuits using different gates. **CO5:** Ability to distinguish the different gate isolation techniques; explain the V-I characteristics of FETs, OP-AMP etc.

Department	Mechanical Engineering
Course Code	ME 201
Title of Course	Engineering Thermodynamics & Fluid Mechanics
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	ME201.1: To **acquire** fundamental **knowledge** in Thermodynamics concepts and encourage the students to observe and **distinguish** the different thermodynamic processes around them. ME201.2: To **Understand** different Laws of Thermodynamics AND AIR STANDARD CYCLES and to **Apply** them in practice when called for. ME201.3: To **Apply** and **Analyze** various relations, tables and charts for problem solving. ME201.4: Be conversant with various concepts of Fluid mechanics and be able to **describe** them. ME201.5: To **Calculate** pressure variations in accelerating fluids **applying** Euler's and Bernoulli's equations ME201.6: To **Apply** the momentum and energy equations to fluid flow problems based on **analysis** of various system specification (i.e. viscid,

	inviscid, rotational, irrotational, steady, unsteady etc.).

Department	Mechanical Engineering
Course Code	CS291
Title of Course	Basic Computation & Principles of Computer Programming
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Out Come	**CO1:** To operate on DOS, UNIX with preliminary commands. **CO2:** To write and execute C programs for solving basic problems viz. prime number generations, computing GCD or LCM etc. **CO3:** To develop real life applications viz. inventory management system, billing systems etc. through C programming.

Department	Mechanical Engineering
Course Code	CH-291
Title of Course	Chemistry-1 Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	21
Course Out Come	**CO1**: Ability to apply concept of Solvent Extraction Procedure **CO2**: Ability to understand Ph metric and conductometric method of determination for acidity and alkalinity of a solution **CO3**: Ability to understand various parameter for the water analysis **CO4**: Ability to understand the viscometric method for determination of solution.

Department	Mechanical Engineering
Course Code	ES291
Title of Course	Basic Electrical & Electronic Engineering – 1I
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P

Total Contact Hours	36
Course Out Come	**CO1:** Ability to calibrate ammeter and voltmeter and analyse shot circuit and open circuit properties of 1-phase transformer. **CO2:** Ability to explain the different properties of DC machines and 3-phase circuit.

Department	Mechanical Engineering
Course Code	ME 292
Title of Course	Basic Engineering Drawing & Computer Graphics
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3
Total Contact Hours	36
Course Outcomes	CO1:**Understanding** and drawing of lines, lettering, dimensioning, scales and geometrical construction of curves. CO2: **Learn** projection of points, lines and surfaces and solids like cube, pyramid, prism, cylinder and cone. CO3: **Drawing** isometric view from orthogonal/sectional views of simple solid objects. CO4: **Understand** and draw full and half sectional views of solids and develop the cut surfaces of prism, cylinder and cone. CO5: **To learn** Computer Aided Drafting using AUTO-CAD.

Department	Mechanical Engineering
Course Code	HU 301
Title of Course	Value and Ethics in Profession
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcome	**CO1**: Ability to understand effects of Technological Growth with its limitation. **CO2**: Ability to learn ethics of Profession in Engineering field. **CO3**: Ability to understand Profession and recognize Human Values

Department	Mechanical Engineering
Course Code	PH-301
Title of Course	Physics-II
Nature of Course	Compulsory
Type of Course	Lecture

Contact Hours	3L+1T
Total Contact Hours	39
Course Out Come	**CO1**: To elaborate the concept of vector calculus and its applications in engineering problem solving. **CO2** To analyze laws of electricity and their applicability. Ability to know the properties of dielectric and explain different properties of Magneto statics, Time Varying Field and Electromagnetic theory **CO3:** To be familiarized with Schrödinger wave equation and its applications. **CO4:** To be familiarized with the basic concept of Statistical Mechanics and to understand the applicability of M-B, B-E and F-D statistics.

Department	Mechanical Engineering
Course Code	CH-301
Title of Course	Basic Environmental Engineering and Elementary Biology
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	40
Course Out Come	**CO1**: Ability to understand Basic ideas of environment, Ecology. **CO2**: Ability to learn Air, Water, Land, & Noise pollution and control. **CO3**: Ability to gain knowledge about the Environmental Management which includesEnvironmental impact assessment, Environmental Audit, laws and protection act of India,Different international environmental treaty/agreement/ protocol.

Department	Mechanical Engineering
Course Code	ME 301
Title of Course	Engineering Thermodynamics
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36

Course Outcomes	1. To know units of pressure, temperature, density, and mass, SI and English, and to use conversions. 2. To know how to use thermodynamic tables and diagrams. 3. To explain the differences between steady state and transient processes. 4. To explain the differences between open and closed systems. 5. To know the meaning and how to obtain from thermodynamic tables and diagrams, specific volume, enthalpy, and internal energy. 6. To explain the meaning and differences of heat and work, and adiabatic and isenthalpic processes. 7. To know how to apply mass and energy balances (First Law) to a variety of simple processes and circumstances. 8. To know the meaning of isentropic processes, to obtain entropy from thermodynamic tables and diagrams. 9. To define the meaning of efficiencies in turbines, compressors, and pumps, and use them to solve problems. 10. To know how to obtain changes in internal energy, enthalpy, and entropy, using equations, tables, or diagrams (Cp's and Cv's). 11. To know and be able to explain the difference between a Carnot and a Rankine cycle. 12. To calculate efficiencies of simple power and refrigeration cycles. 13. To know the meaning of dry and wet bulb temperatures, humidity, and humidity ratio

Department	Mechanical Engineering
Course Code	ME 302
Title of Course	Strength of Materials
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36

Course Outcomes	ME302.1: To get a Concept of mechanics of deformable solids; concept of stress developed against external force/pressure; brief review of normal and shearing stress and strain. Also to understand Deformation of axially loaded members, statically determinate and indeterminate problems. Strain energy in tension and compression. ME302.2: **Analysis** of Biaxial stresses-Mohr's circle for biaxial stress; concept of normal stress, principal stress and pure shear. Shear strain and shear strain energy. Stresses in thin walled pressure vessels-tangential and Hoop stress. Relation between shear modulus and Young's modulus. ME302.3: To **Determine** Stresses in beams; shear force (SF), axial force and bending moment (BM); differential relations for BM, SF and load; SF and BM diagrams; bending stresses in straight beams – symmetric loading; stresses in beams of various cross sections. ME302.4: To **Analyse** Torsion of a circular shaft, shear energy in torsion. Concept of closed and open coiled helical springs, Stresses and deflection of helical springs under axial pull. ME302.5: To **Calculate** Deflection of statically determinate and indeterminate beams due to bending moment, differential equation of elastic line, Area-moment method, Strain energy method- Castigliano's theorem, superposition method. ME302.6: To **Apply** the Theory of columns; eccentric loading of short strut; column buckling: Euler load for columns with pinned ends and other end restraints; Euler's curve; emperical column formulae – (i) straight line, (ii) parabolic and (iii) Rankine Gordon

Department	Mechanical Engineering
Course Code	ME 303
Title of Course	Engineering Materials
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3 L
Total Contact Hours	36

Course Outcomes	CO1: Introduction withMaterial Science—its importance in engineering; Classification of Materials metals, polymers, ceramics, composites, Advanced materials, semiconductors, smart materials, nano-materials, Review atomic structure, Atomic bonding in solids bonding forces and energies, ionic / covalent / metallic bonding. CO2: To understand **Crystal Structure:** Fundamental concepts; Unit cells; seven crystal systems; single crystal, polycrystalline and non-crystalline materials; Metallic crystal structures-FCC, atomic packingfactor, BCC & HCP structures. To know **Imperfections in Metals:** Point defects due to vacancy & impurities, alloys, solid solutions, Dislocations linear defects, interfacial defects, grain boundaries. CO3: To understand **Phase Diagrams:** Definition and basic concepts; solubility limit; Phase equilibria, one component, phase diagram, binary phase diagram, and interpretation of phase diagrams. To know **Iron-carbon System:** allotropy of iron, iron-iron carbide phase diagram, properties and uses of plain carbon steel. CO4: To know Classification of Metals and Alloys- compositions, general properties and uses. To understand **Ferrous alloys:** Classification of low carbon steels, medium carbon steels, high carbon steels. CO5: To know Mechanical Properties of Materials , Materials Selection ,Methodology Treatment, Polymers & Elastomers, Ceramic Materials, Composite materials, Corrosion and Degradation of Engineering Materials.

Department	Mechanical Engineering
Course Code	HU-381
Title of Course	Technical Report Writing & Language Lab Practice
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36

Course Outcomes	HU-381.1 Ability to inculcate a sense of confidence in the students. HU-381.2 Ability to help them become good communicators both socially and professionally. HU-381.3 To assist them to enhance their power of Technical Communication.

Department	Mechanical Engineering
Course Code	PH- 391
Title of Course	Physics Practical -II
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3P
Total Contact Hours	36
Course Out Come	**CO1**: Ability to understand Lande g factor of electron, specific charge of electron and energy band gap of semiconductor. **CO2**: Ability to study Hall effect of semiconductors and characteristics of solar photovoltaic cell.

Department	Mechanical Engineering
Course Code	ME 391
Title of Course	Machine Drawing-I
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36

Course Outcomes	ME391.1: To Understand the Schematic product symbols, welding symbols and pipe joints; for standard components in mechanical and electrical systems. ME391.2: To draw Assembly and detailed drawings of a mechanical assembly, such as a plummer block, tool head of a shaping machine, tailstock of a lathe, welded pipe joints indicating work parts before welding, etc. ME391.3: To draw Orthographic projections of machine elements, different sectional views- full, auxiliary sections; Isometric projection of components.

Department	Mechanical Engineering
Course Code	ME 392
Title of Course	Workshop Practice-II
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Outcomes	ME391.1: Practice of pattern &mould making. ME391.2: Making a typical product using sheet metal. ME391.3: Performing basic Forging processes like upsetting, drawing down and forge welding. ME391.4: Practicing Resistance Spot Welding, Shielded Metal Arc Welding and Gas Welding. ME391.5: Machining of typical products involving lathe, milling/shaping operations and finishing process

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Department	Mechanical Engineering
Course Code	ME 393
Title of Course	Applied Mechanics Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P

Total Contact Hours	24
Course Outcomes	ME393.1: Able to determine experimentally the material behaviourunder Tension and Compression and also find out stress-strain diagram, yield strength, Ultimate strength, modulus of elasticity, of ductile and brittle materials. And also study the ductile nature of the materials by measuring percentage elongation and percentage reduction in areas, observation of fractured surfaces. ME393.2: Conducting the Torsion Test and analyse the shear modulas of elasticity and also study the induction of shear stress under the application of torsional moment. ME393.3: Understanding the application of Hardness Test by Brinnel and Rockwell method for various materials. ME393.4: Experimentally find out the coefficient of friction by inclined plane apparatus and rope-pulley method. ME393.5: Understanding Experimentally Impact strength of different materials. ME393.6: Determination of modulus of Elasticity from deflection of beam method.

Department	Mechanical Engineering
Course Code	M(CS)-401
Title of Course	Numerical Methods
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	L + T 2 + 1
Total Contact Hours	28
Course Out Come	**CO1**: Ability to analyse error and to understand numerical computation & Interpolation. **CO2**: Ability to learn Numerical integration & solution of linear equations. **CO3**: Ability to solve Numerical solution of Algebraic, transcendental equations & ordinary differential equations.

Department	Mechanical Engineering
Course Code	M-402
Title of Course	Mathematics-III
Nature of Course	Compulsory

Type of Course	Lecture
Contact Hours	L + T 3 + 1
Total Contact Hours	42
Course Out Come	**CO1**: Ability to understand Fourier Series & Fourier Transform. **CO2**: Ability to learn Calculus of Complex Variable. **CO3**: Ability to understand Probability. **CO4**: Ability to solve Partial Differential Equations and Ordinary Differential Equations.

Department	Mechanical Engineering
Course Code	ME 401
Title of Course	Fluid Mechanics & Hydraulic Machines
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	ME401.1: Explain fluid properties and fluid statics, Kinematics of fluid flow, Dynamics of fluid, Momentum Analysis of flow systems. ME401.2: Apply basic principle for flow through orifices, notches, weirs, Flow through open channels; Chezy's formula in flow through pipes ME401.3: Apply Dimensional Analysis & Model investigation to flow systems – Buckingham Pi theorem. Dimensionless numbers in fluid flow. ME401.4: Investigate Flow of fluid around submerged bodies; basic concepts of drag and lift. Describe basic concept of Boundary layer theory. ME401.5: Describe Design & working principle of Hydraulic Turbines and Pumps

Department	Mechanical Engineering
Course Code	ME 402
Title of Course	MECHANISMS

Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	ME402.1: Understand theMachine and Mechanism and their constituents, Gruebler'sandGrashof's criterion, and able to visualise and analyse the movability & Degrees of Freedom of Planner Mechanisms and derive various Kinematic inversion of four bar and Slider-Crank Chain. ME402.2: Understand the Velocity and acceleration analysis of Mechanisms and apply analytical and graphical approach for the slider crank mechanism, four bar mechanism, Crank and slotted lever mechanism and other planner mechanisms. ME402.3: Understand the Belt-drive, Law of belting, Length of flat belt for open and cross belt connections; Stepped pulley for open flat belt; Tension in flat belt and V-belts; Power transmitted in belt drive and analyze various belt problems. ME402.4: Understand and analyse Gear terminology, Laws of gearing, types of gears – Spur, Bevel, Helical, Worm; tooth profile, interference; Gear trains – simple, compound, epicyclic gear train; Speed-torque analysis of gear trains and analyze various gear problems. ME402.5: Understand the Classification of Cams and followers; Radial Cam, Analysis of knife-edge, roller and flat face follower motion – constant velocity, simple harmonic, constant acceleration & deceleration; Offset follower and able to design various cam profile. ME402.6: Analyse and Design Kinematic chain. Study of lower pair Mechanisms- Pantograph, Parallel linkage mechanisms, Straight line mechanism, Automobile steering mechanism, Hooks joint.

Department	Mechanical Engineering
Course Code	ME 403
Title of Course	Primary Manufacturing Processes
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4L
Total Contact Hours	40

Course Outcomes	ME403.1: Employ fundamental techniques to manufacture an engineering component. ME403.2: Design core, core print and gating system in metal casting processes. ME403.3: Investigate and develop a methodology and establish a manufacturing sequence to fabricate engineering components . ME403.4: Develop process-maps for metal forming processes using plasticity principles. ME403.5: Identify the effect of process variables to manufacture defect free products

Department	Mechanical Engineering
Course Code	M(CS)-491
Title of Course	Numerical Methods Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	2P
Total Contact Hours	24
Course Out Come	**CO1**: Ability to understand numerical computation & Interpolation. **CO2**: Ability to learn Numerical integration & solution of linear equations. **CO3**: Ability to solve Numerical solution of Algebraic, transcendental equations & ordinary differential equations.

Department	Mechanical Engineering
Course Code	ME 491
Title of Course	Fluid Mechanics & Hydraulic Machines Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36

Course Outcomes	

ME491.1	**Apply** Bernoulli's equation to **measure** flow through pipes using venturimeter&orificemeter and during open channel flow through triangular, rectangular notches.
ME491.2	**Evaluate** hydraulic and overall efficiencies, **determine** unit and specific quantities of Pelton (impulse) and Francis (reaction) turbines.
ME491.3	**Evaluate**manometric and overall efficiencies, **calculate** unit and specific quantities, **analyze** cavitation of rotodynamic pump (centrifugal).
ME491.4	**Analyze** construction, **apprehend** various aspects like gauge pressure and vacuum pressure, single & double acting, multistage of positive displacement type pump (reciprocating). **Calculate** slip and **inspect** the chance of cavitation.

Department	Mechanical Engineering
Course Code	ME 492
Title of Course	Manufacturing Technology Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Outcomes	ME492.1: Experiment with sand specimen prepared for testing the properties of moulding sand like permeability, strength, etc. and examine thereafter the properties of post casting operations. ME492.2: Demonstrate smithy or forging of carbon steels and analyse for its property changes. ME492.3: Explain fabrication processes and compare effects of varying process parameters in GMAW and SMAW and examine the joint defects.

Department	Mechanical Engineering
Course Code	ME 493
Title of Course	Material Testing Lab
Nature of Course	Compulsory

Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Outcomes	ME493.1: Identify right non destructive test to examine the defects for the samples given. ME493.2: Ability to conduct destructive testing experiments on Tensile, compression, Hardness, Bending, Torsion, Impact tests to analyze and interpret mechanical properties of the samples. ME493.3:Ability to prepare standard metallographic samples for engineering materials to examine microstructure. ME493.4: Recognize the methods of fatigue design and finite life design

Department	Mechanical Engineering
Course Code	ME 494
Title of Course	Machine Drawing-II
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Outcomes	ME494.1: **Draw** Assembly and detailed of the given mechanical device, such as a simple gear box, flange coupling, muff coupling, welded bracket joined by stud bolt on to a structure, etc. ME494.2: **Draw** orthographic and isometric projections of the given components using AutoCAD or similar graphics software.

Department	Mechanical Engineering
Course Code	HU 511
Title of Course	Principles & Practices of Management
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	2L
Total Contact Hours	24

Course Outcomes	HU511.1 Definition and **concept** of management. **Learn** contributions made by Taylor, Fayol, Gilbreth,Elton Mayo, McGregor, Maslow – covering Time & Motion Study, Hawthrone Experiments. **Discuss** functions, ethics and social responsibility of managers. HU511.2 **Understand** management process of planning. **Describe** operational plan, strategic planning, Mckinsey's 7's Approach, SWOT analysis. **Learn** concept of controlling. **Acquire** knowledge of decision making and **concept** of organizing. HU511.3 **Acquire** knowledge of recruitment & selection. **Learn** motivation and satisfaction. **Discuss** leadership and its role. **Understand** communication process, HU511.4 **Acquire** knowledge of financial functions of management, financial planning. **Understand** knowledge of Working Capital, Sources of Finance. HU511.5 **Understand** the functions of Marketing, Product Planning & Development. **Learn** conceptof Sales Promotion, Consumer Behaviour, Marketing Research and Information.

Department	Mechanical Engineering
Course Code	ME 501
Title of Course	Dynamics of Machines
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	ME501.1:By using equilibrium/energy/Rayleigh's method, **solve** problems of single DOF vibratory systems (free, damped, forced vibrations) and **demonstrate** vibration isolation. **Determine** critical speed of undamped single DOF vibrating systems. ME501.2: For dynamically equivalent systems, **calculate** inertia force and inertia torque in reciprocating engine. **Analyse** flywheels for speed fluctuations in IC Engines and Presses. ME501.3: **Determine** unbalanced force & moment of rotary as well as reciprocating bodies using analytical and graphical methods. **Demonstrate** static & dynamic balancing of multi-cylinder engines (in-line & V-type). ME501.4: **Demonstrate** specified parameters (viz. sensitiveness, stability, isochronism, hunting, effort, power, controlling force diag., insensitiveness) of Porter, Proell and Wilson-Hartnell governors and **analyse** their stability. ME501.5: **Conceive** stabilization of sea vessels, aeroplanes, two- &

	four-wheeled vehicles taking turn, considering gyroscopic effect on them.

Department	Mechanical Engineering
Course Code	ME 502
Title of Course	Heat Transfer
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	CO1: **Knowledge** about the modes of Heat Transfer, Basic equations of Conduction. Critical thickness of insulation.and solve various conduction related problems. CO2: **Understanding** the Fins and transient heat conduction: lumped parameter approach, and **Analyze** 1-D transient heat conduction solution without heat generation. CO3: **Conception** ofRadiation: and **Analyze** Radiation exchange between GDI surfaces by radiation network. Radiation shielding. CO4: **Basic idea** about Convective heat transfer. **Conception** of developing and developed flow. **Analyze** natural convection over a vertical plate. Concept and correlations. CO5: **Study** of Heat exchangers. **Application** of LMTD and E- NTU methods for heat exchangers.

Department	Mechanical Engineering
Course Code	ME 503
Title of Course	Design of Machine Elements
Nature of Course	Compulsory
Type of Course	Lecture

Contact Hours	4L
Total Contact Hours	48
Course Outcomes	**CO1**: **Understanding** Objective and scope of Mechanical Engineering Design; Design considerations; Review and selection of materials and manufacturing processes; codes and standards. **CO2**: **Analyzing** Modes of failure; Design/allowable stress; Factor of safety (FoS); Theories of failure – maximum normal stress theory, maximum shear stress theory, Distortion energy theory. Choice of Failure criteria; Design for stability : buckling analysis – Johnson and Euler columns. **CO3**: **Understanding** Fatigue in metals; S-N curve; Endurance limit and fatigue strength; Stress concentration factors – effect of discontinuity, fillets and notches; Effect of size, surface finish, stress concentration and degree of reliability on endurance limit; Design for finite and infinite life; Goodman, modified Goodman and Soderberg diagrams with respect to fatigue failure under variable stresses; Cumulative fatigue damage – Miner's equation. **CO4**: **Analyzing and understanding** Design of (i) Cotter joint; (ii) Knuckle joint and (iii) Fillet Welded joint of brackets under different types of loading; Bolted joints : Metric thread, standard sizes, use of lock nuts and washers; Applications in structures including brackets, turn buckle; Pre-stressed bolts; Riveted joints : Unwin's formula; Brief discussion on single, double and triple row lap joints, butt joints with single or double strap / cover plate; simple strength design; joint efficiencies. **CO5**: **Understanding** design and evaluate the design parameters of :(i) Solid and hollow shafts, strength design of shafts, design based on torsional rigidity;(ii) Shaft coupling-rigid, pin-bush and geared flexible type, alignment of coupling;(iii) Belt drives-geometrical relations, derivation of torque and power transmission by flat and V-belt drives,selection of belt from manufacturers' catalogues, pulley(iv) Chain drives – roller chains, polygonal effect, power rating, sprocket wheel, silent chain. **CO6**: **Understanding** Design of:(i) Transmission screw, Screw jack,(ii) Helical compression spring - stress and deflection equations, stiffness, curvature effect : Wahl's factor, springs in parallel and series;(iii) Multi-leaf springs : load-stress and load-deflection equations.elements

Department	Mechanical Engineering
Course Code	ME 504
Title of Course	Measurement and Instrumentation
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4 L
Total Contact Hours	40

Course Outcomes	1.The student shall be measuring the various parameters like length, height, angle, displacement etc., by using various instruments like vernier calipers, micrometers, dial indicator, etc. 2.The student shall be able to measure the threads, gear tooth profiles and surface roughness using appropriate instruments and analyze the data. 3. The student shall be able to recognize various types of governors and gyroscopes, and improve their performance as per requirement. 4. The student shall be able to determine the balancing forces, inertial forces of rotating and reciprocating components in real life problems. 5.The student shall be able to check alignment of various components in various mechanisms using advanced scientific tools.

Department	Mechanical Engineering
Course Code	ME 505 A
Title of Course	Electrical Machine
Nature of Course	Professional Elective
Type of Course	Lecture
Contact Hours	3 L
Total Contact Hours	36
Course Outcomes	ME 505 A.1: Ability to explain fundamentals of DC generators and DC motors. ME 505 A.2: Ability to explain and analyze construction, operational mechanism and characteristics of 3ϕ induction motor ME 505 A.3: Ability to explain and analyze construction, operational mechanism and characteristics of Synchronous Machine ME 505 A.4: Ability to explain and analyze construction, operational mechanism and characteristics of Special machines eg:- Single phase induction motor, stepper, servo motor, Brushless DC motor.

Department	Mechanical Engineering
Course Code	ME 505 B
Title of Course	Applied Fluid Mechanics
Nature of Course	Professional Elective
Type of Course	Lecture
Contact Hours	3 L
Total Contact Hours	36

Course Outcomes	ME 505 B.1: To learn about the Specific energy, Hydraulic Jump, Compressible Flow & Ideal Fluid Flow. ME 505 B.2: To understand the analysis of flow through propellers and windmills. ME 505 B.3: To study of mechanical, hydraulic and volumetric loss in a turbo-pump ME 505 B.4: Testing of hydroturbines, different performance characteristics of hydroturbines.

Department	Mechanical Engineering
Course Code	ME 581
Title of Course	Seminar-I
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Outcomes	ME581.1: **Develop** interest towards research oriented field with ability to search the literature and brief report preparation. ME581.2: **Develop** the skills, competencies and points of view needed by Engineering professionals ME581.3: **Discuss** and critically think about topics of current intellectual importance. ME581.4: **Improve** interpersonal & communication skills and awareness about the industrial environment. ME581.5: **Improve** in logical and rational interaction.

Department	Mechanical Engineering
Course Code	ME 592
Title of Course	Applied Thermodynamics & Heat Transfer Lab.
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3

Total Contact Hours	36
Course Outcomes	ME 592.1: Applying Thermodynamics on air compressor and throttling calorimeter ME 592.2: Evaluation of thermal properties like conductivity, Convective heat transfer coefficient, emissivity ME 592.3: Thermal analysis on FIN apparatus

Department	Mechanical Engineering
Course Code	ME 593
Title of Course	Design Practice 1
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	24
Course Outcomes	ME593.1 Designing Knuckle/Cotter joint,Bolted bracket/ turn buckle ME593.2 Designing Screw jack ME593.3 Designing Riveted joints,. ME593.4 Designing Shaft Couplings ME593.5 Designing Helical compression spring/ Leaf spring

Department	Mechanical Engineering
Course Code	ME 594
Title of Course	Measurement Lab.
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36

Course Outcomes	1. The student shall be measuring the various parameters like length, height, angle, displacement, flatness etc., by using various instruments like vernier calipers, micrometer, dial indicator, etc. 2. The student shall be able to measure the threads and gear tooth profiles using appropriate instruments. 3. Demonstrate the use of instruments for measuring linear (internal and external), angular dimensions. 4. Angle and taper measurement by slip gauges and Sine bar. 5. Measurement of bore diameter by vernier caliper and by four ball method.

Department	Mechanical Engineering
Course Code	ME 595 A
Title of Course	Electrical Machine lab
Nature of Course	Professional Elective lab
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Outcomes	ME 595 A.1: To **find** out the characteristics of separately excited DC generators and compound generators. ME 595 A.2: To **learn** about performance of DC series motor ,D.C Compound Motor. ME 595 A.3: **Study** of methods of speed control of three phase squirrel cage induction motors, and determination of equivalent circuit of three phase squirrel cage induction motors ME 595 A.4: To **find** out regulation of an Alternator. ME 595 A.5: To **perform** load test on a single phase induction motor and find its equivalent circuit.

Department	Mechanical Engineering
Course Code	ME 595 B
Title of Course	Applied Fluid Mechanics Lab
Nature of Course	Professional Elective lab
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36

Course Outcomes	ME 595 B.1: To Study of cavitation characteristics of centrifugal pump & characteristics of submerged jet. ME 595 B.2: To Study of characteristics of hydraulic jump & Study of cavitation phenomenon. ME 595 B.3: Verification of Stokes law & Determination of loss through pipes and fittings. ME 595 B.4: Performance test of pumps in series & parallel.

Department	Mechanical Engineering
Course Code	HU 611
Title of Course	Production & Operations Management
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	2L
Total Contact Hours	24
Course Outcomes	HU611.1 **Concept** of production, Product life cycle, Productivity. **Learn** Process and product focused organization structures. HU611.2 **Acquire** knowledge of forecasting and its techniques.**Concept**of materials management and Inventory Control.**Understand** EOQ model, ABC analysis and Just-in-time inventory management. HU611.3 **Concept** of MRP, master production schedule and MRP calculations. HU611.4 **Concept** of Single machine scheduling. **Learn** about minimizing makespan with identical parallel machines. **Discuss** Johnson's rule for 2 and 3 machines scheduling. **Understand** activity analysis, critical path method (CPM) and crashing of project network. HU611.5 **Discuss** Quality, Quality assurance system. **Learn** about Process control charts : x-chart and Rchart, p-chart and c-chart. **Concept** of Acceptance sampling and Operating characteristic (O.C) curve. **Learn** concept of Six Sigma.

Department	Mechanical Engineering

Course Code	ME 601
Title of Course	IC Engines and Gas Turbines
Nature of Course	Compulsory
Type of Course	Theory
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	CO1: **Study** of Classification and working of basic engine types. **Analysis** of Combustion in I.C. engines. CO2: **Understanding** of Fuel- air mixing in S.I. engines, **Analysis** of simple carburetor, fuel-oil injection system in C.I. engines and Ignition systems in I.C. engines. CO3: **Conception** of Supercharging and scavenging of I.C. engines, Principles of lubrication in I.C engine. Air and liquid cooling of I.C. engines, Pollution control and emissions of I.C. engines. CO4: **Analysis** of Performance and testing of I.C. engines; CO5: **Applications** of Gas Turbine Cycles & its Performances.

Department	Mechanical Engineering
Course Code	ME 602
Title of Course	Machining Principles and Machine
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36

Course Outcomes	ME602.1: To **Explain** metal cutting tool theories and Implement it to solve simple numerical on related concepts. ME602.2: To **Understand** the cause and effect of cutting temperature and cutting tool failure. Focus on improvement of machinability by evaluation of optimum cutting velocity and tool life ME602.3: To **Classify** and analyse constructional features of various machine tools like lathe, shaper, drilling, milling , grinding etc. ME602.4: To **Understand** kinematic structure of various machine tools and focus on design of speed gear box for controlling speed and feed. **Estimate** machining time for various machining operations. ME602.5: To**Describe** automation and basic features and characteristics of NC and CNC machine tools.

Department	Mechanical Engineering
Course Code	ME 603
Title of Course	Machine Design
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	ME603.1 **Understanding and analyzing** the technical aspects of Clutches ME603.2 **Understanding and analyzing** technical features of Brakes ME603.3 **Applying** ASME standard, **evaluate** the dimensions of Gears ME603.4 **Applying** codes, design of pressure vessels. ME603.5 **Understanding** technical knowhow of Flywheel design. ME603.6 **Applying** manufacturer's catalogue, selection of Rolling& sliding contact bearings.

Department	Mechanical Engineering
Course Code	ME 604 A
Title of Course	Air Conditioning & Refrigeration
Nature of Course	Elective
Type of Course	Theory

Contact Hours	3L
Total Contact Hours	36
Course Outcomes	CO1: To **define** and **explore** Refrigeration and Air-conditioning. CO2: To **review** of Simple Vapour Compression Refrigeration System (Simple VCRS). CO3: **Understanding** Air Refrigeration System (ARS):**.** CO4: **Understanding** Vapour Absorption Refrigeration System (VARS). CO5: **Understanding** the control of major Refrigeration Equipment. CO6: To **define** and **explore** Psychometry.

Department	Mechanical Engineering
Course Code	ME 604 B
Title of Course	Mechatronics
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	CO1: To **define** and **explore** Mechatronics. To know the application of Mechatronics in design and manufacturing. To compare between Traditional and Mechatronic approach: con current engineering. CO2: To **review** of fundamentals of electronics. To **know** and be able to **apply** Logic gates and their operation, Signal. Processing devices, Data conversion devices, input and output devices. Sensors and Transducers, Actuators, Limit switches, Relays. CO3: **Understanding** controlsystems: Open loop and closed loop control, block diagrams, transfer functions, Laplace transforms. To be able to perform Mathematical modeling of physical systems, such as spring-mass vibration system, linear and rotary motion and its Laplace transforms. To comprehend the basics of time domain analysis, Introduction to discrete- time systems and Z- transform. To be able to use and apply of on – off, PI and PID controllers to control different drives, programming in PLC controller using ladder diagram**.** CO4: To get in depth knowledge of different kind actuators and drives: Electrical drives: steppers motors, servo drives. Mechanical drives: different mechanism, ball screws, linear motion bearing. Transfer systems, pneumatic and Hydraulic drives: Elements of pneumatic and hydraulic drives, comparison between them. Designing of pneumatic

	and hydraulic circuits, symbolic representations of such circuits indicating CO5: To be acknowledged with the basics of 8085 microprocessor, programmable register architecture, buses, memory mapping, clock pulse and data transfer operations. To be able to **apply** 8085 microprocessor programs for simple control operations. CO6: To be able to **design** various Mechatronics systems, such as automatic brake, door closing and opening, robot CNC machine, AGV, etc.

Department	Mechanical Engineering
Course Code	ME 604 C
Title of Course	Fluid Power Control
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	CO1: To **define** and **explore** Fluid power. CO2: **Understanding** the desired properties of a hydraulic fluid. CO3: To **know** the different Hydraulic machines**.**

Department	Mechanical Engineering
Course Code	ME 605 A
Title of Course	Materials Handling
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3 L

Total Contact Hours	36
Course Outcomes	ME605A.1: **Analyze** the benefit of an efficient material handling system ME605A.2: Study of effective process layout **design** on the material handling system ME605A.3: **Describe** the importance of proper material handling and storage techniques ME605A.4: **Recommend** improvements to existing plant layouts from the standpoint of material handling ME605A.5: **Integrate** concepts and techniques learned through this course in order to **design** efficient material handling equipment

Department	Mechanical Engineering
Course Code	ME 605 B
Title of Course	Finite Element Method
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3 L
Total Contact Hours	36
Course Outcomes	CO1: To **define** and **explore** FEM to design problems. CO2: To **review** of **One dimensional problems**. CO3: **Understanding Two dimensional problems– scalar variable problems & vector variable problems.** CO4: **Understanding Isoparametric elements for two dimensional problems**. CO5: **Understanding Computer implementation**.

Department	Mechanical Engineering
Course Code	ME 605C
Title of Course	Turbo Machinery

Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	ME 605C. 1: Remembering of fluid flow and basic thermodynamics ME 605C. 2: Application of Hydraulic machines ME 605C. 3: understanding of dimensional analysis ME 605C. 4: Analysis of compressible fluid flow machines ME 605C. 5: Evaluation of Turbomachinesperfomance

Department	Mechanical Engineering
Course Code	ME 691
Title of Course	Machining & M/c Tools Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Outcomes	ME691.1: Measurement of cutting forces (Pz and Px or Py), average cutting temperature & surface roughness in straight turning at different feeds and velocities. ME691.2: Study of chip formation (type, color & thickness) through experiment in turning mild steel and evaluation of role of variation of cutting velocity and feed on chip reduction coefficient /cutting ratio and shear angle . ME691.3: Understanding & performing of tool- wear and evaluation of tool life in turning mild steel by HSS or carbide tool. ME691.4: Performing Geometrical and kinematic test of a centre lathe or a drilling machine. ME691.5: Producing a cast iron ‘V’ block & a straight toothed spur gear from a cast or forged disc by machining.

Department	Mechanical Engineering
Course Code	ME 692
Title of Course	IC Engine Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	36
Course Outcomes	**ME692.1: Understanding** the working of MPFI (Multi Point Fuel Injection) and a catalytic converters and its effects on the flue gas of an IC Engines by studying the cut model and working model respectively. **ME692.2**: Knowledge/ skill to **analyze** flue gas by Orsat apparatus. **ME692.3**: Knowledge to **evaluate** calorific value of a fuel by using Bomb calorimeter, the valve opening and closing positions, valve overlap, different performance parameters of single cylinder both petrol and Diesel engines and multi-cylinder petrol engine (Morse test).

Department	Mechanical Engineering
Course Code	ME 693
Title of Course	Design Practice 2
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	24
Course Outcomes	ME693.1 **Understanding & Creating** 2-D and 3-D modelling of mechanical components and systems using software packages like AUTOCAD, Creo 2 or similar software ME693.2 **Designing and analyzing** of mechanical components using software packages like, Creo 2 or similar software. ME693.3 **Applying** codes, design Pressure vessel and Gear ME693.4 **Understanding** the design parameters and selection of rolling element bearings from manufacturer's catalogue

Department	Mechanical Engineering
Course Code	ME 694
Title of Course	Dynamics of Machines Lab
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3P
Total Contact Hours	24
Course Outcomes	ME694.1: **Determine** frequency of vibratory systems (free, damped, forced vibrations) of single and more DOF in linear and rotary given experimental systems. ME694.2: Static and dynamic balancing of rotating masses. ME694.3: Experiments on working of governor, operation and analysis. ME694.4: Experiments on working of gyroscope, operation and analysis. ME694.5: **Demonstrate** operation of the given cam-follower mechanism and **determine** its jump speed.

Department	Mechanical Engineering
Course Code	ME 695A
Title of Course	**Air Conditioning & Refrigeration Lab**
Nature of Course	Elective
Type of Course	Practical
Contact Hours	3 P
Total Contact Hours	36

Course Outcomes	CO1: To Study of a Domestic Refrigerator & room (window type) Air Conditioner. CO2: To Determine C.O.P of a vapour compression refrigeration system. CO3: Experiment in an Air Conditioning Test Unit;. CO4: Performance test of thermoelectric refrigeration system.

Department	Mechanical Engineering
Course Code	ME 695B
Title of Course	Mechatronics Laboratory
Nature of Course	Elective
Type of Course	Practical
Contact Hours	3 P
Total Contact Hours	36
Course Outcomes	CO1: To **investigate** open and closed loop systems and to **apply** such systems for various control systems like temperature , speed control etc. CO2: To **learn** about various logic gates 74 series ICs and be able to **design** some simple circuits and thus **understand** architecture of complex systems. CO3: To **learn** microprocessor and microcontroller programming and be able to apply such system for designing of control systems like speed control, traffic control and others automatic control systems. CO4: To **investigate** pneumatic actuation systems and be able to **design** pneumatic circuits for various industrial applications. CO5: **To learn** PLC and PLC programming and be able to **design** PLC based control systems.

Department	Mechanical Engineering
Course Code	ME 695C

Title of Course	Fluid Power Control Lab
Nature of Course	Elective
Type of Course	Practical
Contact Hours	3 P
Total Contact Hours	36
Course Outcomes	CO1: To Study of a Hydraulic Trainer system. CO2: To P Study of neumatic Trainer system. CO4: To **investigate** pneumatic actuation systems and be able to **design** pneumatic circuits for various industrial applications. CO5: **To learn** PLC and PLC programming and be able to **design** PLC based control systems.

Department	Mechanical Engineering
Course Code	ME 701
Title of Course	Power Plant Engineering
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours/week	4L
Total Contact Hours	48
Course Outcomes	**ME701.1Analyse**Power plant cycles, reheat, regenerative and binary vapor and co-generation cycles. **Analyse** Coal and combustion: Properties of coal, ultimate analysis and proximate analysis, combination calculation. **ME701.2Describe** Boilers: Definition, classification, fire tube and water tube boilers, mountings and accessories. **Investigate** Draft in boilers and performance of boiler - boilers efficiency, equivalent evaporation, Losses in boilers, Fuel bed firing, PF firing and Fluidized bed boilers. **Understand** boiling and circulation in boilers. Power station boilers - Benson, Lamont. Supercritical boiler. Condensers – Basic ideas. **ME701.3Investigate** Steam turbine- i) parts and classification, ii) nozzles types, flow through nozzles and nozzle efficiency.Impulse turbine - velocity diagram, work done and blade efficiency. **Analyse**

	Pressure compounding and velocity compounding of steam turbine. Impulse reaction turbine - Velocity diagram, degree of reaction and Parsons turbine. **Explain** Governing in Steam turbine. **ME701.4** Investigate Power plant economics: load curve and various factors, cost of power generation.Introduction to Hydel, Nuclear and Renewable power plants

Department	Mechanical Engineering
Course Code	ME 702
Title of Course	Adv. Manufacturing Technology
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	4L
Total Contact Hours	48
Course Outcomes	ME702.1: To **understand** components of manufacturing system, automation and CNC tooling. ME702.2: To **develop** part programs with G-Codes, M-Codes and APT. ME702.3: To **describe and differentiate** non-traditional manufacturing techniques like AJM, WJM, USM, PAM and be able to **compute** process parameters ME702.4: To **understand** CM, ECM, EDM, and Wire Cut- EDM and **evaluate** process parameters. ME702.5: To **Describe** and **distinguish** Rapid prototyping techniques.

Department	Mechanical Engineering
Course Code	ME 703A
Title of Course	Maintenance Engineering
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L

Total Contact Hours	36
Course Outcomes	ME703A.1: Understand the Introduction: Definitions of repair and maintenance; Importance of maintenance; Different maintenance systems- breakdown, preventive, planned; predictive maintenance through condition monitoring; Maintainability, failure pattern, availability of equipment / systems, design for maintainability. ME703A.2: Analyze the Total Productive Maintenance (TPM). ME703A.3: Understand the Organizational structures for maintenance. ME703A.4: Analyze the Economic Aspect of Maintenance. ME703A.5: Understand the Function and use of Maintenance Equipment. ME703A.6: Understand the lubrication, Repair & Maintenance Procedures.

Department	Mechanical Engineering
Course Code	ME 703B
Title of Course	Renewable Energy Systems
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	ME703A.1: Understand Principles of Renewable Energy. ME703A.2: Understand the Solar radiation & Solar Water Heating. ME703A.3: Understand the Wind Power, Biomass & Biofuels & Wave Power & tidal Power. ME703A.4: Understand the Ocean Thermal Energy Conversion, Geothermal Energy & Energy Storage.

Department	Mechanical Engineering
Course Code	ME 703 C
Title of Course	Tribology
Nature of Course	Elective

Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	ME703C.1: Understanding about the Introduction to History of tribology, Industrial Importance of tribology. Understanding Engineering Surfaces: Properties and Measurement: Measurement Methods, Surface Profilometry, and Statistical Description of Roughness. ME703C.2: Understanding Surface Contact: Hertz contact theory, Greenwood Williamson model, Elastic-plastic Contact. ME703C.3: Understanding Adhesion: Basic Models, Factors influencing Adhesion. Understanding Friction: Measurement Methods, Origin of Friction, Friction Theories – adhesion and ploughing, Mechanisms, Friction of Metals, and Non-metallic Materials. ME703C.4: Understanding Wear, Types of wear: Adhesive, Abrasive, Corrosive, Fatigue, Minor Forms: Fretting, Erosion, Percussion, Delamination Theory, Wear Debris Analysis, Wear Testing Methods, Wear of Metals, Ceramics, Polymers. ME703C.5: Understanding Surface Engineering: Surface Treatments: Microstructural and Thermochemical Treatments, Surface Coatings: Hard Facing, Vapour Deposition Processes: PVD, CVD,PECVD etc. ME703C.6: Applying Lubrication: Basic Equations for Fluid Film Lubrication. Hydrodynamic lubrication Thrust and Journal bearings, Squeeze Film Bearings, Hydrostatic lubrication, Gas Lubrication. Understanding Lubrication of rolling element bearings. Understanding Boundary lubrication – metal working lubrication, solid film lubrication. Hygiene of Lubricants. Understanding Nano-tribology: Measurement Tools: Surface Force Apparatus, Scanning Tunneling Microscope, Atomic / Friction Force Microscope. Microscope, Atomic / Friction Force Microscope

Department	Mechanical Engineering
Course Code	ME 704A
Title of Course	Quantity Production Method
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L

Total Contact Hours	36
Course Outcomes	CO1: To Study of Engineering Production & Quantity production methods. CO2: To learn Planning and scheduling, Productivity and quality enhancement in Quantity production. CO3: To Study of Group technology, Non-conventional manufacturing of products in quantity.

Department	Mechanical Engineering
Course Code	ME 704B
Title of Course	Advanced Welding Technology
Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	ME704B.1: **Discriminate** the knowledge of principles, operations and applications of various welding processes and welding power sources ME704B.2: **Demonstrate**principles and applications of various critical and precision welding processes ME704B.3: **Demonstrate**the effects of process parameters on the weldments and **analyse** their quality. ME704B.4: **Apply** the knowledge of welding to select the right kind of welding technique suitable for various materials ME704B.5: **Test** and **Evaluate** the quality of welded joints using various testing methods, Welding defects and remedial measures

Department	Mechanical Engineering
Course Code	ME 704C
Title of Course	Computational Methods in Engineering

Nature of Course	Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	CO1: To Study of Approximations, Algebraic equations & Interpolation methods . CO2: To learn Differentiation and Integration, Transform techniques & Differential Equations . CO3: To Study of Regression methods & Statistical methods.

Department	Mechanical Engineering
Course Code	ME 705 A
Title of Course	Software Engineering
Nature of Course	Free Elective-I
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	CO1: To Study of Software Engineering, System Requirement Specification & System Design. CO2: To learn Coding & Documentation . CO3: To Study of Software Project Management.

Department	Mechanical Engineering

Course Code	ME 705 B
Title of Course	Industrial Instrumentation
Nature of Course	Free Elective-I
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	CO1: To Study of **ACCELEROMETER AND VIBROMETER, Elastic transducers, Electrical Pressure gauges & Vacuum gauges.** CO2: To learn **Non- Electrical gauges, Electrical gauges & Non contact type temperature gauges** . CO3: To Study of different flow meter . CO4: To Study of **Non-Electrical & Electrical level gauge** .

Department	Mechanical Engineering
Course Code	ME 705 C
Title of Course	Operations Research
Nature of Course	Free Elective-I
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	

ME705C.1	**Apprehend** the theory of linear, integer and nonlinear programming problems and **solve** various real life problems using suitable algorithms.
ME705C.2	**Apply** the knowledge of basic theory of transportation and assignment to reduce the transportation cost.
ME705C.3	**Analyze and investigate** network flow problems with most economical path.
ME705C.4	**Analyze** various waiting line problems, **determine** service pattern to improve the quality of service.
ME705C.5	**Apprehend** different decision making situations, **identify** optimum strategy from several decision alternatives and **apply** them in real life situations.

Department	Mechanical Engineering
Course Code	ME 705 D
Title of Course	Biomechanics & Biomaterials
Nature of Course	Free Elective-I
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	CO1: To Study of Musculoskeletal Anatomy, Basic Dynamics to Human Motion & Fundamental Strength of Materials in Biological Tissues. CO2: To learn Physico-chemical properties of biomaterials. CO3: To Elements in contact with the surface of a biomaterial. CO4: Testing of biomaterials.

Department	Mechanical Engineering
Course Code	ME 791
Title of Course	Adv Manufacturing Lab
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	3P
Total Contact Hours	24

Course Outcomes	ME791.1: **Write** NC part program of the given Al rod with product dimensions on CNC Turning Centre ME791.2: **Write** NC part program of the given Al rod with product dimensions on CNC Milling Machine. ME791.3: **Demonstrate** geometry of robot manipulator, actuators and grippers. ME791.4: **Write** program of the given Robot motion data on the on the given robotic software. ME791.5: **Write** NC part program of the given Al rod with product dimensions on CNC Turning Centre

Department	Mechanical Engineering
Course Code	ME 781
Title of Course	Project: Part-I
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	4P
Total Contact Hours	48
Course Outcomes	ME781.1: Select topic of the project & Generating its objectives ME781.2: Practice finding relevant course material on the Internet and non-electronic sources ME781.3: Prepare work plan and Preliminary report ME781.4: Prepare presentation and explaining it to the audience

Department	Mechanical Engineering
Course Code	ME 782
Title of Course	Viva-voce on VT
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	
Total Contact Hours	

Course Outcomes	ME782.1: Able to demonstrate industrial processes. ME782.2: Comprehend basics of industrial safety. ME782.3: Function effectively as an individual, and as a member or leader in teams. ME782.4: Recognize the need for life-long learning.

Department	Mechanical Engineering
Course Code	ME 783
Title of Course	Group Discussion
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	
Total Contact Hours	
Course Outcomes	ME783.1: Developing initiative and cooperating behavior ME783.2: Acquiring sufficient knowledge of current national and international topics, general awareness of developments in various fields, etc. ME783.3: Be able to express himself/ herself confidently and assertively. ME783.4: Taking other members along and not straying with futile arguments

Department	Mechanical Engineering
Course Code	ME 801 (HU)
Title of Course	Economics for Engineers
Nature of Course	Compulsory
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcome	**CO1**: Ability to understand Economic Decisions Making and considering that students willlearn to find out Engineering Costs & Estimation. **CO2**: Ability to learn Cash Flow and also able to calculate Rate of

	Return Analysis. **CO3**: Ability to know Inflation and Price Change, Present Worth Analysis. **CO4**: Ability to learn depreciation and able to analysis the requirement of replacement.

Department	Mechanical Engineering
Course Code	ME 802 A
Title of Course	CAD/CAM
Nature of Course	Professional Elective-VI
Type of Course	Lecture
Contact Hours	3 L
Total Contact Hours	36 L
Course Outcomes	ME802A.1: Develop Geometric Modeling-wire frame, surface and solid modeling transformation ME802A.2: Analyse stress-strain based on FEM. ME802A.3: Understand tooling of CNC machines and Application of Robot ME802A.4: Demonstrate Computer aided-production planning and control. ME802A.5: Summarise Control system, Process Monitoring and automatic inspection system.

Department	Mechanical Engineering
Course Code	ME 802 B
Title of Course	Industrial Robotics
Nature of Course	Professional Elective
Type of Course	Lecture
Contact Hours	3 L
Total Contact Hours	36

Course Outcomes	ME802B.1: **Analyse** Robotic Anatomy and its Kinematics. ME802B.2: **Demonstrate** various Robot End Effectors and actuators. ME802B.3: **Demonstrate** Robot Sensors. ME802B.4: **Demonstrate** online and offline Robot Programming techniques and **write** programs of the given robot motion data. ME802B.5: **Illustrate** industrial applications of Robots.

Department	Mechanical Engineering
Course Code	ME 802 C
Title of Course	Energy Conservation & Management
Nature of Course	Professional Elective-VI
Type of Course	Lecture
Contact Hours	3 L
Total Contact Hours	36 L
Course Outcomes	**CO1: To Study of** The Energy Resources; Finite & Renewable, Need for Energy Conservation- estimation of Finite fuel resource; Hubbert's model for oil reserve **CO2: To learn** Total Energy Concept & Waste Heat Recovery**.** **CO3: To Study of** Industrial Energy Conservation & Energy Audit**.** **CO4: To learn** The Economics of Energy Saving Schemes **.**

Department	Mechanical Engineering
Course Code	ME 802 D
Title of Course	Quality & Reliability Engineering
Nature of Course	Professional Elective-VI
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36 L

Course Outcomes	CO1: To Study of Management of Product Quality, Creating Quality by Design & Total Quality Management. CO2: To learn Process Control, Quality Management Systems & Strategic tools and Techniques for TQM. CO3: To Study of Reliability & Risk Assessment & Reliability in Design.

Department	Mechanical Engineering
Course Code	ME 803 A
Title of Course	Safety & Occupational Health
Nature of Course	Professional Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	CO1: To Study of Development of industrial safety, Accidents and their prevention & Fire hazard. CO2: To learn Occupational health and safety, Health and safety at workplaces. CO3: To Study of Health and safety management & Accident compensation.

Department	Mechanical Engineering
Course Code	ME 803 B
Title of Course	Automation & Control
Nature of Course	Professional Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36

Course Outcomes	CO1: To Study of control system, Time domain analysis. CO2: To learn State variable Analysis. CO3: To Study of Stability Analysis using root locus & Control System performance measure.

Department	Mechanical Engineering
Course Code	ME 803 C
Title of Course	Water Resource Engineering
Nature of Course	Professional Elective
Type of Course	Lecture
Contact Hours	3L
Total Contact Hours	36
Course Outcomes	ME 803C. 1: **Remembering and introducing** of fluid mechanics and dimensional analysis ME 803C. 2: **Application and Evaluation** of close conduit flow ME 803C. 3: **Application** of open channel flow ME 803C. 4: **Application and Enalyzation** of surface water hydrology ME 803C. 5: **Application and evaluation** of ground watering hydrology

Department	Mechanical Engineering
Course Code	ME 803 D
Title of Course	Automobile Engineering
Nature of Course	Free Elective
Type of Course	Lecture
Contact Hours	3L

Total Contact Hours	36
Course Outcomes	ME803D.1: **To Understand** and **demonstrate** the basic parameter of Mechanical system of IC engine ME803D.2: **To Understand** the working of different types Fuel system and **able** to distinguish between Petrol & Diesel engine. ME803D.3: **To Understand** of various types of Lubrication system and parameters of lubrication oil ME803D.4: **To Understand** and **demonstrate** the importance of Cooling System and also about various cooling system for IC engine. ME803D.5: **To Understand** and **demonstrate** the various types of Ignition System. ME803D.6: **To Understand** and **demonstrate** the basic parameter of Mechanical system of IC engine .

Department	Mechanical Engineering
Course Code	ME 881
Title of Course	Design of Mechanical System
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	6P
Total Contact Hours	72
Course Outcomes	ME881.1: **Analyze** and **solve** mechanical design problems by applying mathematics and fundamentals of mechanical engineering. ME881.2: Prepare, **analyze**, **evaluate** and modify mechanical engineering drawings and other related technical documents. ME881.3: **Design** and **analyze** mechanical components, processes and systems by applying fundamentals of mechanical engineering. ME881.4: **Contribute** in a team in development of the course report.

Department	Mechanical Engineering
Course Code	ME 882
Title of Course	Project: Part-II

Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	12
Total Contact Hours	
Course Outcomes	ME882.1: **Demonstrate** qualitative solutions to research /industry problems involving contemporary issues. ME882.2: **Formulate** hypothesis/design/methodology ME882.3: **Apply** the knowledge of the techniques, skills, and modern engineering tools necessary for Mechanical Engineering practice ME882.4: **Present** features of the developed project to the targeted group through written and oral communication. ME882.5: **Present** features of the developed project to the targeted group through written and oral communication.

Department	Mechanical Engineering
Course Code	ME 883
Title of Course	Comprehensive Viva
Nature of Course	Compulsory
Type of Course	Practical
Contact Hours	
Total Contact Hours	
Course Outcomes	ME883.1: **Prepare** comprehensively to answer questions from all the courses of eight semesters. ME883.2: **Develop** oral presentation skills by answering questions in precise and concise manner. ME883.3: **Gain** confidence and inter-personal skills.