



DEPARTMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR 2022-2023

COURSE OUTCOMES

ACADEMIC YEAR 2022-23

SEMESTER 1

Course Code: MAT 101

Course Name: LINEAR ALGEBRA AND CALCULUS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	It introduces students to some basic mathematical ideas and tools which are at the core of any engineering course. A brief course in Linear Algebra familiarises students with some basic techniques in matrix theory which are essential for analysing linear systems.	solve systems of linear equations, diagonalize matrices and characterise quadratic forms
2	The calculus of functions of one or more variables taught in this course are useful in modelling and analysing physical phenomena involving continuous change of variables or parameters and have applications across all branches of engineering.	compute the partial and total derivatives and maxima and minima of multivariable functions
		compute multiple integrals and apply them to find areas and volumes of geometrical shapes, mass and centre of gravity of plane laminae
		perform various tests to determine whether a given series is convergent, absolutely convergent or conditionally convergent
		determine the Taylor and Fourier series expansion of functions and learn their applications

Course Code: CYT 100

Course Name: ENGINEERING CHEMISTRY

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	the students to acquire knowledge in the concepts of chemistry for engineering applications and to familiarize the students with different application oriented topics like spectroscopy, electrochemistry, instrumental methods etc.	Apply their knowledge for protection of different metals from corrosion. To prevent the monuments from getting corroded, recent trends in electrochemical energy storage devices.
	Also familiarize the students with topics like mechanism of corrosion, corrosion prevention methods, SEM, stereochemistry, polymers, desalination etc., which enable them to develop abilities and skills that are relevant to the study and practice of chemistry.	Learn how to use different spectroscopy techniques for analysis purpose of simple molecules.
		Design economically and new methods of synthesis nano materials.
		Substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
		Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.

Course Code: EST 100

Course Name: ENGINEERING MECHANICS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	the students to the fundamental concepts of mechanics and enhance their problem-solving skills	Recall principles and theorems related to rigid body mechanics
	It introduces students to the influence of applied force system and the geometrical properties of the rigid bodies while stationary or in motion.	Identify and describe the components of system of forces acting on the rigid body
	After this course students will be able to recognize similar problems in real-world situations and respond accordingly.	Apply the conditions of equilibrium to various practical problems involving different force system
		Choose appropriate theorems, principles or formulae to solve problems of mechanics
		Solve problems involving rigid bodies, applying the properties of distributed areas and masses

Course Code: EST 130

Course Name: BASICS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	The aims to (1) equip the students with an understanding of the fundamental principles of electrical engineering.	Demonstrate safety measures against electric shocks
	2) provide an overview of evolution of electronics, and introduce the working principle and examples of fundamental electronic devices and circuits.	identify the tools used for electrical wiring ,electrical accessories, wires, cables, batteries and standard symbols
	(3) provide an overview of evolution of communication systems, and introduce the basic concepts in radio communication.	Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings.
		Identify and test various electronic components. Assemble and test electronic circuits on boards
		Draw circuit schematics with EDA tools a team with good interpersonal skills

Course Code: HUN 101

Course Name: LIFE SKILLS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	Life skills are those competencies that provide the means for an individual to be resourceful and positive while taking on life's vicissitudes.	Define and Identify different life skills required in personal and professional life
	Development of one's personality by being aware of the self, connecting with others, reflecting on the abstract and the concrete, leading and generating change, and staying rooted in time-tested values and principles is being aimed at.	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress..
	This course is designed to enhance the employability and maximize the potential of the students by introducing them to the principles that underly personal and professional success, and help them acquire the skills needed to apply these principles in their lives and careers	Explain the basic mechanics of effective communication and demonstrate these through presentations.
		Explain the basic mechanics of effective communication and demonstrate these through presentations.
		Understand the basics of teamwork and leadership

Course Code: CYL 120

Course Name: ENGINEERING CHEMISTRY LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	To impart scientific approach and to familiarize with the experiments in chemistry relevant for research projects in higher semesters	Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses
		Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs
		Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds
		Acquire the ability to understand, explain and use instrumental techniques for chemical analysis
		Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments. Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum

Course Code: ESL 130

Course Name: ELECTRICAL & ELECTRONICS WORKSHOP

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	Electrical Workshop is intended to impart skills to plan and carry out simple electrical wiring.	Demonstrate safety measures against electric shocks
	It is essential for the practicing engineers to identify the basic practices and safety measures in electrical wiring.	identify the tools used for electrical wiring ,electrical accessories, wires, cables, batteries and standard symbols
		Develop the connection diagram, identify the suitable accessories and materials necessary for wiring simple lighting circuits for domestic buildings.
		Identify and test various electronic components. Assemble and test electronic circuits on boards
		Draw circuit schematics with EDA tools a team with good interpersonal skills

ACADEMIC YEAR 2022-23

SEMESTER 2

Course Code: MAT 102

Course Name: VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	It is introduces the concepts and applications of differentiation and integration of vector valued functions, differential equations, Laplace and Fourier Transforms	Compute the derivatives and line integrals of vector functions and learn their applications
	The objective of this course is to familiarize the prospective engineers with some advanced concepts and methods in Mathematics which include the Calculus of vector valued functions, ordinary differential equations and basic transforms such as Laplace and Fourier Transforms which are invaluable for any engineer's mathematical tool box.	Evaluate surface and volume integrals and learn their inter-relations and applications
	The topics treated in this course have applications in all branches of engineering	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients
		Compute Laplace transform and apply them to solve ODEs arising in engineering
		Determine the Fourier transforms of functions and apply them to solve problems arising in engineering

Course Code: PHT 100

Course Name: ENGINEERING PHYSICS A (FOR CIRCUIT BRANCHES)

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	the Engineering Physics Program is to offer students a solid background in the fundamentals of Physics and to impart that knowledge in engineering disciplines.	Compute the quantitative aspects of waves and oscillations in engineering systems
	The program is designed to develop scientific attitudes and enable the students to correlate the concepts of Physics with the core programmes	Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments
		Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices.
		Classify the properties of magnetic materials and apply vector calculus to static magnetic fields and use Maxwell's equations to diverse engineering problems
		Analyze the principles behind various superconducting applications, explain the working of solid state lighting devices and fibre optic communication system

Course Code: EST 120

Course Name: BASICS OF CIVIL & MECHANICAL ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	This course is to provide an insight and inculcate the essentials of Civil Engineering discipline to the students of all branches of Engineering and to provide the students an illustration of the significance of the Civil Engineering Profession in satisfying the societal needs.	Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
		Explain different types of buildings, building components, building materials and building construction
		Describe the importance, objectives and principles of surveying.
		Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps
		Discuss the Materials, energy systems, water management and environment for green buildings.
		Analyse thermodynamic cycles and calculate its efficiency
		Illustrate the working and features of IC Engines
		Explain the basic principles of Refrigeration and Air Conditioning
		Describe the working of hydraulic machines
		Explain the working of power transmission elements
		Describe the basic manufacturing, metal joining and machining processes

Course Code: EST 110

Course Name: ENGINEERING GRAPHICS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	The student to effectively perform communication through graphical representation global standards.	Draw the projection of points and lines located in different quadrants
		Prepare multi-view orthographic projections of objects by visualizing them in different positions
		Draw sectional Views and develop surfaces of a given object
		Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.
		Convert 3D viewsto orthographic views, Obtain multiview projections and solid models of objects using CAD tools

Course Code: HUN 102

Course Name: PROFESSIONAL COMMUNICATION

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	Clear, precise, and effective communication has become a sine qua non in today's information-driven world given its interdependencies and seamless connectivity.	. Understand the role of communication in personal & professional success
	Any aspiring professional cannot but master the key elements of such communication.	. Understand the role of communication in personal & professional success
	The objective of this course is to equip students with the necessary skills to listen, read, write, and speak so as to comprehend and successfully convey any idea, technical or otherwise, as well as give them the necessary polish to become persuasive communicators	Prepare and present messages with a specific intent.
		Analyze a variety of communication acts.
		Ethically use, document and integrate sources

Course Code: EST 102

Course Name: PROGRAMING IN C

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	C programs to solve computational problems that they may have to solve in their professional life.	Analyze a computational problem and develop an algorithm/flowchart to find its solution
	The course content is decided to cover the essential programming fundamentals which can be taught within the given slots in the curriculum.	Write readable C programs with arrays, structure or union for storing the the data to be processed
	This course has got 2 Hours per week for practicing programming in C. A list showing 24 mandatory programming problems are given at the end.	Write readable C programs with arrays, structure or union for storing the the data to be processed
	The instructor is supposed to give homework/assignments to write the listed programs in the rough record as and when the required theory part is covered in the class. The students are expected to come prepared with the required program written in the rough record for the lab classes.	Write readable C programs which use pointers for array processing and parameter passing
		Develop readable C programs with files for reading input and storing output

Course Code: PHL :120

Course Name: ENGINEERING PHYSICS LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	the students gain practical knowledge to co-relate with the theoretical studies and to develop practical applications of engineering materials and use the principle in the right way to implement the modern technology.	Compute the quantitative aspects of waves and oscillations in engineering systems
		Apply the interaction of light with matter through interference, diffraction and identify these phenomena in different natural optical processes and optical instruments
	.	Apply the concept of polarization to understand the wave nature of light and the method of analyzing the light whether it is polarized or not. Explain types of superconductivity and their applications
		Analyze the behaviour of matter in the atomic and subatomic level through the principles of quantum mechanics to perceive the microscopic processes in electronic devices
		Compute the quantitative aspects of waves and oscillations in engineering systems

Course Code: ESL:120

Course Name: CIVIL & MECHANICAL WORKSHOP

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	The course is designed to train the students to identify and manage the tools, materials and methods required to execute an engineering project.	Name different devices and tools used for civil engineering measurements
	Students will be introduced to a team working environment where they develop the necessary skills for planning, preparing and executing an engineering project.	Explain the use of various tools and devices for various field measurements
	To enable the student to familiarize various tools, measuring devices, practices and different methods of manufacturing processes employed in industry for fabricating components	Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work.
		Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.
		Compare different techniques and devices used in civil engineering measurements
		Identify Basic Mechanical workshop operations in accordance with the material and objects
		Apply appropriate Tools and Instruments with respect to the mechanical workshop trades
		Apply appropriate safety measures with respect to the mechanical workshop trades

ACADEMIC YEAR 2022-23

SEMESTER 3

Course Code: MAT201

Course Name: PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS

Sl. No.	Course Objectives	Learning Outcomes (Course Outcomes)
1.	To understand basic ideas of partial differential equations which are widely used in the modelling and analysis of a wide range of physical phenomena	Understand the concept and the solution of partial differential equation.
2.	To understand the practical importance of solving differential equations. understand the differences between initial value and boundary value problems (IVPs and BVPs)	Analyse and solve one dimensional wave equation and heat equation
3.	To understand the basic theory of functions of a complex variable, describe conformal mappings between various plane regions.	Understand complex functions, its continuity differentiability with the use of Cauchy Riemann equations.
4.	To study the techniques of complex variables and functions together with their derivatives and Contour integration .	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function
5.	To study complex power series, classification of singularities, calculus of residues and its applications in the evaluation of integrals, and other concepts and properties.	Understand the series expansion of complex function about a singularity and apply residue theorem to compute several kinds of real integrals.

Course Code: MCN 201

Course Name: SUSTAINABLE ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To inculcate in students an awareness of environmental issues and the global initiatives towards attaining sustainability.	Understand the relevance and the concept of sustainability and the global initiatives in this direction
2	To realize the potential of technology in bringing in sustainable practices.	Explain the different types of environmental pollution problems and their sustainable solutions
3		Discuss the environmental regulations and standards
4		Outline the concepts related to conventional and non-conventional energy
5		Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles

Course Code: HUT 200

Course Name: PROFESSIONAL ETHICS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes	
1	To enable students to create awareness on ethics and human values.	CO 1	Understand the core values that shape the ethical behavior of a professional
2		CO 2	Adopt a good character and follow an ethical life.
3		CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics
4		CO 4	Solve moral and ethical problems through exploration and assessment by established experiments
5		CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.

Course Code:MET 205

Course Name: METALLRGY & MATERIAL SCIENCE

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Understanding of the correlation between the chemical bonds and crystal structure of metallic materials to their mechanical properties.	Understand the basic chemical bonds, crystal structures (BCC, FCC, and HCP), and their relationship with the properties.
2	Recognize the importance of crystal imperfections including dislocations in plastic deformation. Learning about different phases and heat treatment methods to tailor the properties of Fe-C alloys.	Analyze the microstructure of metallic materials using phase diagrams and modify the microstructure and properties using different heat treatments.
3	Examine the mechanisms of materials failure through fatigue and creep.	How to quantify mechanical integrity and failure in materials.
4	To determine properties of unknown materials and develop an awareness to apply this knowledge in material design	Apply the basic principles of ferrous and non-ferrous metallurgy for selecting materials for specific applications.
5		Define and differentiate engineering materials on the basis of structure and properties for engineering applications.

Course Code: MET 203

Course Name: MECHANICS OF FLUIDS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course provides an introduction to the properties and behaviour of fluids.	Define Properties of Fluids and Solve hydrostatic problems
2	It enables to apply the concepts in engineering, pipe networks.	Explain fluid kinematics and Classify fluid flows
3	It introduces the concepts of boundary layers, dimensional analysis and model testing	Interpret Euler and Navier-Stokes equations and Solve problems using Bernoulli's equation
4		Evaluate energy losses in pipes and sketch energy gradient lines
5		Explain the concept of boundary layer and its applications
		Use dimensional Analysis for model studies

Course Code:MET 201

Course Name: MECHANICS OF SOLIDS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course helps the students to understand the concept of stress and strain in different types of structure/machine under various loading conditions.	Determine the stresses, strains and displacements of structures by tensorial and graphical(Mohr's circle) approaches
2	The course also covers simple and compound stresses due to forces, stresses and deflection in beams due to bending, torsion in circular section, strain energy, different theories of failure, stress in thin cylinderthick cylinder and spheres due to external and internal pressure.	Analyse the strength of materials using stress-strain relationships for structural and thermal Loading
3		Perform basic design of shafts subjected to torsional loading and analyse beams subjected to bending moments
4		Determine the deformation of structures subjected to various loading conditions using strain energy methods
5		Analyse column buckling and appreciate the theories of failures and its relevance in engineering design

Course Code: HUT 200

Course Name: PROFESSIONAL ETHICS

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes	
	To enable students to create awareness on ethics and human values.	CO 1	Understand the core values that shape the ethical behavior of a professional
		CO 2	Adopt a good character and follow an ethical life.
		CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics
		CO 4	Solve moral and ethical problems through exploration and assessment by established experiments
		CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.

Course Code: MEL 201

Course Name: COMPUTER AIDED MACHINE DRAWING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To introduce students to the basics and standards of engineering drawing related to machines and components.	Apply the knowledge of engineering drawings and standards to prepare standard dimensioned drawings of machine parts and other engineering components.
2	To make students familiarize with different types of riveted and welded joints, surface roughness symbols; limits, fits and tolerances.	Prepare standard assembly drawings of machine components and valves using part drawings and bill of materials
3	To convey the principles and requirements of machine and production drawings.	Apply limits and tolerances to components and choose appropriate fits for given assemblies
4	To introduce the preparation of drawings of assembled and disassembled view of important valves and machine components used in mechanical engineering applications.	Interpret the symbols of welded, machining and surface roughness on the component drawings.
5	To introduce standard CAD packages for drafting and modeling of engineering components.	Prepare part and assembly drawings and Bill of Materials of machine components and valves using CAD software.

Course Code: MEL 203

Course Name: MATERIAL TESTING LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The objective of this course is to give a broad understanding of common materials related to mechanical engineering with an emphasis on the fundamentals of structure-property application and its relationships.	To understand the basic concepts of analysis of circular shafts subjected to torsion.
2		To understand the behaviour of engineering component subjected to cyclic loading and failure concepts
3		Evaluate the strength of ductile and brittle materials subjected to compressive, Tensile shear and bending forces
4		Evaluate the micro structural morphology of ductile or brittle materials and its fracture modes (ductile /brittle fracture) during tension test
5		To specify suitable material for applications in the field of design and manufacturing.

ACADEMIC YEAR 2022-23

SEMESTER 4

Course Code: EST 200

Course Name: DESIGN AND ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The objective of this course is to give an introduction to the basic principles of engineering design, inform them about the steps involved in the design process process and Familiarize them with the basic tools and design techniques to be used	Explain the different concepts and principles involved in design engineering.
2	Students are expected to learn and apply design thinking during engineering training, which is very important and relevant today.	Apply design thinking while learning and practicing engineering.
3	Case studies from different practical contexts can help students understand that design is not only about functionality, but also about various life cycle issues with multiple factors such as customer, economy and reliability.	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.

Course Code: MAT 204

Course Name: PROBABILITY RANDOM PROCESS AND NUMERICAL METHODS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To introduce the modern theory of probability and its applications to modelling and analysis and processing of random processes and signals	Understand the concept, properties and important models of discrete random variables and using them analyses suitable random phenomena.
2	To understand some basic numerical methods for interpolation and integration and also for finding roots of equations and solutions of ODEs.	Understand the concept, properties and important models of continuous random variables and using them analyses suitable random phenomena.
3	To learn most of the important models of discrete and continuous probability distributions and widely used models of random process such as Poisson process	Analyse random processes using autocorrelation, power spectrum and Poisson process model as appropriate.
4		Compute roots of equations, evaluate definite integrals and perform interpolation on given numerical data using standard numerical techniques.
5		Apply standard numerical techniques for solving systems of equations, fitting curves on given numerical data and solving ordinary differential equations.

Course Code: MCN202

Course Name: CONSTITUTION OF INDIA

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes	
1	To understand their own country's constitution and study the importance of environment as well as understand their own human rights and to help the students to concentrate on their day-to-day discipline.	MCN202.1	Explain the background of the present constitution of India and features.
2	It also gives the knowledge and strength to face the society and people.	MCN202.2	Utilize the fundamental rights and duties.
3		MCN202.3	Understand the working of the union executive, parliament and judiciary.
4		MCN202.4	Explain the background of the present constitution of India and features.
5		MCN202.5	Utilize the fundamental rights and duties.

Course Code:EST 200

Course Name:DESIGN AND ENGINEERING

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes	
1	Explain the different concepts and principles involved in design engineering.	EST200.1	Students will be able to appreciate the different elements involved in good designs and to apply them in practice when called for.
2	Apply design thinking while learning and practicing engineering.	EST200.2	Students will be able to discover the product oriented and user-oriented aspects that make the design a success.
3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.	EST200.3	Students will be capable of formulating innovative designs incorporating different segments of knowledge gained in the course
		EST200.4	Students will have a broader perspective of analyzing designs covering function, cost, environmental sensitivity, safety factors along with engineering analysis.
		EST200.5	Students will be able to think of different design solutions and evaluate them to choose optimum solution.

Course Code: MET206

Course Name: FLUID MACHINERY

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To acquire knowledge on hydraulic machines such as pumps and turbines.	Students will be able to define the principles and working of Hydraulic Machines.
2	To prepare the students to solve complex problems related to fluid forces on a vane.	Students will be able to estimate the hydrodynamic forces on various types of vanes and to calculate the performance of various hydraulic machines.
3	To Introduce the concepts of design aspects of hydraulic machines like turbines and pumps and their applications.	Students will be able to design an appropriate pump/turbine with reference to given application/situation. Carry out calculations involved in design of pump/turbine.
4	To understand the working of air compressors and do the analysis	Students will be able to understand the relation between various performance parameters and to interpret characteristic curves of a given pump/turbine/compressor.
5	Describe the operating characteristics of Fluid machinery (pumps, turbines and compressors), and the factors affecting their operation and specifications, as well as their operation in a system.	Students will be able to define the principles and working of various type of compressors.

Course Code: MET 204

Course Name: MANUFACTURING PROCESS

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To gain theoretical and practical knowledge in material casting processes and develops an understanding of the dependent and independent variables which control materials casting in a production processes.	Illustrate the basic principles of foundry practices and special casting processes, their advantages, limitations and applications.
2	Provide a detailed discussion on the welding process and the physics of welding. Introduce students to different welding processes weld testing and advanced processes to be able to appreciate the practical applications of welding.	Categorize welding processes according to welding principle and material.
3	The course will also provide methods of analysis allowing a mathematical/physical description of forming processes.	Understand requirements to achieve sound welded joint while welding different similar and dissimilar engineering materials.
4	Correlate the material type with the possible fabrication processes	Student will estimate the working loads for pressing, forging, wire drawing etc. processes
5	Generate solutions to problems that may arise in manufacturing engineering	Recommend appropriate part manufacturing processes when provided a set of functional requirements and product development constraints.

Course Code: MET 202

Course Name: ENGINEERING THERMODYNAMICS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	Engineering devices like engines,turbines, refrigeration and air conditioning systems, propulsion systems etc., work on energy transformations and must be analysed using principlesof thermodynamics.	Understand basic concepts and laws of thermodynamics
2	This course offers an introduction to the basic concepts and laws of thermodynamics.	Conduct first law analysis of open and closed systems
3		Determine entropy and availability changes associated with different processes
4		Understand the application and limitations of different equations of state
5		Determine change in properties of pure substances during phase change processes and evaluate properties of ideal gas mixtures

Course Code:MEL 202

Course Name:FM & HM LAB

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes	
1	This lab is mainly focussed to develop a platform where the students can enhance their engineering knowledge in the fluid mechanics domain by applying their theoretical knowledge acquired.	CO 1	Determine the coefficient of discharge of flow measuring devices (notches, orifice meter and Venturi meter)
		CO 2	Calibrate flow measuring devices (notches, orifice meter and Venturi meter)
		CO 3	Evaluate the losses in pipes
		CO 4	Determine the metacentric height and stability of floating bodies
		CO5	Determine the efficiency and plot the characteristic curves of different types of pumps and turbines

Course Code:MEL 204

Course Name:MACHINE TOOLS LAB- I

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes	
1	To understand the parts of various machine tools and impart hands on experience on lathe, drilling, shaping, milling, slotting, grinding, tool and cutter grinding machines...	CO 1	The students can operate different machine tools with understanding of work holders and operating principles to produce different part features to the desired quality.
2	To develop knowledge and importance of metal cutting parameters such as feed, velocity and depth of cut etc on cutting force and surface roughness obtainable	CO 2	Apply cutting mechanics to metal machining based on cutting force and power consumption
3	To develop fundamental knowledge on tool materials, cutting fluids and tool wear Mechanisms	CO 3	Select appropriate machining processes and process parameters for different metals.
4	To apply knowledge of basic mathematics to calculate the machining parameters for different machining processes.	CO 4	Fabricate and assemble various metal components by welding and students will be able to visually examine their work and that of others for discontinuities and defects.
5	To study process parameters and practice on arc and gas welding technologies	CO5	Infer the changes in properties of steel on annealing, normalizing, hardening and tempering.
6	To gain knowledge on the structure, properties, heat treatment, testing and applications of ferrous and non-ferrous metals.		

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SEMESTER 5

Course Code: MET303

Course Name: THERMAL ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To study the steam power cycle and components	Explain the working of steam power cycle and related components
2	To study steam turbine.	Discuss the working of steam turbines and methods for evaluating the performance
3	To Study the IC engines process and tests	Illustrate the performance testing and evaluation of IC engines
4	To Study the combustion process of IC engine	Explain the combustion phenomenon and pollution in IC engines
5	To study the refrigeration and air conditioning	Discuss the principles of refrigeration and air-conditioning and basic design considerations

Academic Year (2022-2023)- Even Semester

Course Code: MET 312

Course Name: Non-destructive testing

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
	To learn the fundamental techniques such as Visual and liquid penetrant inspection methods for inspecting the material's flaws/defects.	Remember the fundamentals of materials and Visual inspection possibilities.
	To describe the advanced inspection methods such as Magnetic, Ultrasonic, Radiography and eddy current techniques	Understand how to use Liquid penetrant for inspecting the materials.
	To calibrate the instruments and interpret their results in a better way.	Describe the Magnetization techniques and testing methods
		Illustrate the material's defect using Ultrasonic testing and its calibration.
		Evaluate the material structure using Radiography and Eddy current testing.

Course Code: MET 307

Course Name: Machine tools & Metrology

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
	To develop the knowledge in structure and working principle of basic industrial machineries	Understand the basic principle and structure of industrial machineries.
	To study the various operations and estimate the required machining parameters to improve the machining quality.	Analyze the required accessories and cutting parameters to ensure the optimum working condition.
	To get exposure on the standards and concept of different measuring tools/equipment.	Apply the different mechanisms and methods to perform various operations.
		Express the basic concepts and standards in measuring tools/process
		Measure the geometry using various measuring tools and technology.

Course Code: MCN301

Course Name: DISASTER MANAGEMENT

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The objective of this course is to introduce the fundamental concepts of hazards and disaster management.	Students will be able to define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle.
2		Students will be able to distinguish between different hazard types and vulnerability types and do vulnerability assessment
3		Students will be able to identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk.
4		Student will be able to explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community.
5		Student will be able to identify factors that determine the nature of disaster response and discuss the various disaster response actions
6		Student will be able to explain the various legislations and best practices for disaster management and risk reduction at national and international level

Course Code: HUT300

Course Name: INDUSTRIAL ECONOMICS AND FOREIGN TRADE

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To equip the students to take industrial decisions and to create awareness of economic environment.	To equip the students to take industrial decisions and to create awareness of economic environment.
2		To equip the students to take industrial decisions and to create awareness of economic environment.
3		To equip the students to take industrial decisions and to create awareness of economic environment.
4		To equip the students to take industrial decisions and to create awareness of economic environment.
5		To equip the students to take industrial decisions and to create awareness of economic environment.

Course Code: MCN 301

Course Name: DISASTER MANAGEMENT

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To introduce the fundamental concepts of hazards and disaster management.	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level: Understand).
2		Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level: Understand).
3		Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level: Understand).
4		Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive knowledge level: Apply)
5		Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level: Understand).
6		Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level: Understand).

Course Code: MEL 331

Course Name: MACHINE TOOL LAB-II

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To learn the measurement of bores by internal micrometers, bore indicators, indirect methods etc.	Apply the procedures to measure length, angles, width, depth, bore diameters, internal and external tapers, tool angles, and surface roughness by using different instruments and by different indirect methods.
2	To learn the measurement of the Angle and taper by Bevel protractor, Sine bars, indirect methods etc.	Determine limits and fits and allocate tolerances for machine components
3	Allow to study the various limits, fits and tolerances adopted in the production drawings.	CNC programming and to use coordinate measuring machine to record measurements of complex profiles with high sensitivity.
4	To learn to measure straightness, flatness, roundness, profile, screw threads and gear teeth.	Use effective methods of measuring straightness, Squareness, flatness, roundness, profile, screw threads and gear teeth.
5	To learn, to prepare programs for CNC machines and measurements in CMM.	Securing knowledge of manufacturing components within the tolerance limit and surface roughness according to given drawings using various machine tools.

Course Code: MEL 333

Course Name: THERMAL ENGINEERING LAB-1

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The course is intended to impart basic understanding on the working of internal combustion engines.	Measure thermo-physical properties of solid, liquid and gaseous fuels
2	This includes various performance tests on internal combustion engines as well as makes the students familiar with the evaluation of fuel properties such as viscosity, flash and fire points, calorific value etc. which are key to any performance test.	Identify various systems and subsystems of Diesel and petrol engines
3		Analyse the performance characteristics of internal combustion engines
4		Investigate the emission characteristics of exhaust gases from IC Engines
5		Interpret the performance characteristics of air compressors / blowers

ACADEMIC YEAR 2022-23

SEMESTER 6

Course Code: MET302

Course Name: Heat & Mass Transfer

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	1.To introduce the various modes of heat transfer and to develop methodologies for solving a wide variety of practical heat transfer problems	Apply principles of heat and mass transfer to engineering problems
2	1.To provide useful information concerning the performance and design of simple heat transfer systems	Analyse and obtain solutions to problems involving various modes of heat transfer
3	1.Conceive the energy balance in any thermal practical situation involving heat transfer mechanisms.	Design heat transfer systems such as heat exchangers, fins, radiation shields etc.
4	1.To introduce mass transfer. .	Define laminar and turbulent boundary layers and ability to formulate energy equation in flow systems.

Course Code: MET 304

Course Name: DYNAMICS AND DESIGN OF MACHINERY

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
	This course focuses on important topics of dynamics of machinery and design of machine elements. It covers the topics namely force of four bar mechanisms, design of flywheels, welded joints, riveted joints and spring. Design of machine elements due to impact, shock and fatigue loading are covered in the syllabus. Analysis of free and forced vibration of single degree of freedom systems and a brief introduction about free vibration of two degree of freedom systems is also included.	CO 1- Do engine force analysis and to draw turning moment diagrams
		CO 2 - Analyse free and forced vibrations of single degree of freedom systems
		CO3 - Determine the natural frequencies of a two degree of freedom vibrating system and to calculate the stresses in a structural member due to combined loading
		CO4 - Design machine elements subjected to fatigue loading and riveted joints
		CO5 - Design welded joint and close coiled helical compression spring

Course Code: MET 306

Course Name:ADVANCED MANUFACTURING ENGINEERING

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes	
1	To enable students to create awareness on advanced forms of manufacturing processes	CO 1	To be conversant with the advanced machining process and to appreciate the effect of process parameters on the surface integrity aspects during the advanced machining process.
		CO 2	Will be able to understand CNC programming, select appropriate tooling and fixtures
		CO 3	Understand To categorize the various non-traditional material removal process based on energy sources and mechanism employed.
		CO 4	Analyse the processes and evaluate the role of each process parameter during micro machining of various advanced material removal processes
		CO 5	Will be able to explain the processes used in additive manufacturing for a range of materials and applications

Course Code: HUT310

Course Name: Management for Engineers

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course is intended to help the students to learn the basic concepts and functions of management and its role in the performance of an organization and to understand various decision-making approaches available for managers to achieve excellence. Learners shall have a broad view of different functional areas of management like operations, human resource, finance and marketing.	CO1 Explain the characteristics of management in the contemporary context (Cognitive Knowledge level: Understand).
2		CO2 Describe the functions of management (Cognitive Knowledge level: Understand).
3		CO3 Demonstrate ability in decision making process and productivity analysis (Cognitive Knowledge level: Understand).
4		CO4 Illustrate project management technique and develop a project schedule (Cognitive Knowledge level: Apply).
5		CO5 Summarize the functional areas of management (Cognitive Knowledge level: Understand).
6		CO6: Comprehend the concept of entrepreneurship and create business plans (Cognitive Knowledge level: Understand).

Course Code: MET 308

Course Name: COMPREHENSIVE COURSE WORK

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
	The course is designed to ensure that the students have firmly grasped the foundational knowledge in Mechanical Engineering familiar enough with the technological concepts	Learn to prepare for a competitive examination
	It provides an opportunity for the students to demonstrate their knowledge in various Mechanical Engineering subjects.	Comprehend the questions in Mechanical Engineering field and answer them with confidence
		Communicate effectively with faculty in scholarly environments
		Analyze the comprehensive knowledge gained in basic courses in the field of Mechanical Engineering

Course Code: MEL 332

Course Name: COMPUTER AIDED DESIGN & ANALYSIS LAB

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To introduce students to the basics and standards of engineering design and analysis related to machine components.	Gain working knowledge in Computer Aided Design and modelling procedures.
2	To make students familiarize with different solid modelling and analysis soft wares	Gain knowledge in creating solid machinery parts.
3	To convey the principles and requirements of modelling and analysis of machine elements.	Gain knowledge in assembling machine elements.
4	To introduce the preparation of part modelling and assembly modelling of machineries	Gain working knowledge in Finite Element Analysis.
5	To introduce standard CAD packages to perform Finite Element Analysis of machine parts	Solve simple structural, heat and fluid flow problems using standard software

Course Code: MEL 334

Course Name: THERMAL ENGINEERING LAB-II

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	The course is intended to enable the students to get exposed to equipment related to heat and mass transfer.	Evaluate thermal properties of materials in conduction, convection and radiation
2	This includes understanding the working of equipments related to various heat transfer processes viz conduction, convection, radiation and mass transfer.	Analyse the performance of heat exchangers
3	These equipments are heat exchangers, refrigeration and air conditioning systems, compressor/blower and their applications in real life problems.	Illustrate the operational performances of refrigeration and air conditioning systems
4	Also the thermo physical properties of materials which are integral to these equipments will also be evaluated.	Perform calibration of thermocouples and pressure gauges
5		

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SEMESTER 7

Course Code: MPT 401

Course Name: MACHINE DESIGN

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes	
1	Fundamental Concepts in Design, Materials and their properties, Design for static loading, Design for fatigue loading, Stress concentration,	CO 1	Calculate the stresses acting on machine components subjected to multi-axial loading and design same based on static theories of failure.
2	Design of shafts, Design of keys and pins, Design of couplings, Design of riveted joints, Design of welded joints, Design of bolted joints, Design of springs	CO 2	Apply the knowledge of fatigue failure in the analysis and design of mechanical components
		CO 3	Analyse and designs hafts under various loading conditions
		CO 4	Analyze and design permanent joints under various loading conditions
		CO 5	Analyze and design mechanical springs for various loading conditions

Course Code:CET415

Course Name: ENVIRONMENTAL IMPACT ASSESSMENT

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course introduces the methodologies for identifying, predicting, evaluating and mitigating the impacts on environment due to any developmental project or activities.	Explain the need for minimizing the environmental impacts of developmental activities
2	Students will learn how to prepare an impact assessment report and devise an environment management plan.	Outline environmental legislation & clearance procedure in the country
3	Sufficient background will be provided on the environmental clearance procedures in India.	Apply various methodologies for assessing the environmental impacts of any developmental activity
4		Prepare an environmental impact assessment report
5		Conduct an environmental audit

Course Code: MCN 401

Course Name: INDUSTRIAL SAFETY ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To give knowledge of various safety management principles, various safety systems, various machine guarding devices, hazard identification techniques, energy sources, systems & applications and the need in the present context.	"Describe the theories of accident causation and preventive measures of industrial accidents"
2	To compare different hazard identification tools and choose the most appropriate based on the nature of the industry.	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping
3	It aims to equip students in working with projects and to take up research work in connected areas	Explain different issues in construction industries.
4		Describe various hazards associated with different machines and mechanical material handling.
5		Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.

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Course Code: MET 453

Course Name:Hybrid and Electric Vehicles

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
	To learn the basic structure of electric and hybrid vehicles, operating characteristics of suitable motors	Remember the development, impacts and structure of electric and hybrid vehicles
	To describe the various controller units and sensors for motor, battery and thermal management of systems	Understand the different kind of motor configurations and characteristics
	To design a chassis and optimize the gearbox, transmission and charging possibilities	Describe the controller units, transmission and gear box optimization
		Analyze the suitable sensors in thermal management system and batteries
		Apply the basic concepts in chassis design, validation and vector simulations

Course Code: MED 415

Course Name: PROJECT PHASE I

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To apply engineering knowledge in practical problem solving.	Model and solve real world problems by applying knowledge across domains
2	To foster innovation in design of products, processes or systems.	Develop products, processes or technologies for sustainable and socially relevant applications
3	To develop creative thinking in finding viable solutions to engineering problems	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
4		Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
5		Identify technology/research gaps and propose innovative/creative solutions
6		Organize and communicate technical and scientific findings effectively in written and oral forms

Course Code: MEQ 413

Course Name: SEMINAR

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To do literature survey in a selected area of study.	Identify academic documents from the literature which are related to her/his areas of interest
2	To understand an academic document from the literature and to give a presentation about it.	Read and apprehend an academic document from the literature which is related to her/ his areas of interest
3	To prepare a technical report.	Prepare a presentation about an academic document
4		Give a presentation about an academic document
5		Prepare a technical report

ACADEMIC YEAR 2022-23

SEMESTER 8

Course Code: MET 414

Course Name: QUALITY MANAGEMENT

SI No.	Course Objectives	Subject Learning Outcomes or course outcomes
	This course is designed to facilitate the students to understand the concept and culture of total quality management. It empowers the students by inculcating the skills to use quality control techniques and other quality tools in solving quality-related problems and apply these principles in an industry. This course will also amalgamate their knowledge about the importance of customer satisfaction through desired quality at a competitive price.	CO 1- To be conversant with important terms for quality management in organisations
		CO 2 - Have a complete theoretical and practical understanding of the contributions of Quality Gurus
		CO3 - Demonstrate knowledge of the underlying principles of strategic quality management
		CO4 - Identify various human dimensions of TQM
		CO5 - Implement different tools and techniques in TQM
		CO 6 - Identify core and extended modules of ISO 9000 family of standards

Course Code:MET466

Course Name:TECHNOLOGY MANAGEMENT

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	CO1	Be conversant with important terms for technology management in organisations
2	CO2	Explain the need of technology forecasting
3	CO3	Understand the essence of technology acquisition
4	CO4	Describe the elements of technology strategy
5	CO5	Outline the basics of innovation.
6	CO6	Identify human factors in technology management

Course Code: MET 458

Course Name: ADVANCED ENERGY ENGINEERING

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	This course provides basic ideas about various energy source and its environmental impacts.	Explain the concept of various types of power generation
2		Explain solar and wind power generation and its economics
3		Explain biomass energy sources and its economics
4		Explain various renewable energy sources
5		Explain environmental impacts of various energy generation

Course Code: MET402

Course Name: MECHATRONICS

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To study the Mechatronics system and sensors	Explain the sensors and actuators used in mechatronics
2	To study hydraulic and pneumatic system	Design hydraulic and pneumatic circuits for automation.
3	To Study the MEMS based manufacturing processes	Explain the manufacturing processes used in MEMS
4	To Study the CNC machine components	Demonstrate the various components of a CNC machine
5	To study the PLC logics	Create a PLC program
6	To study the vision system in robotics.	Explain the robotic sensors and vision system

Course Code: MED 416

Course Name: PROJECT PHASE II

Sl No.	Course Objectives	Subject Learning Outcomes or course outcomes
1	To apply engineering knowledge in practical problem solving.	Model and solve real world problems by applying knowledge across domains
2	To foster innovation in design of products, processes or systems.	Develop products, processes or technologies for sustainable and socially relevant applications
3	To develop creative thinking in finding viable solutions to engineering problems	Function effectively as an individual and as a leader in diverse teams and to comprehend and execute designated tasks
4		Plan and execute tasks utilizing available resources within timelines, following ethical and professional norms
5		Identify technology/research gaps and propose innovative/creative solutions
		Organize and communicate technical and scientific findings effectively in written and oral forms