



# VARDHAMAN COLLEGE OF ENGINEERING (AUTONOMOUS)

Affiliated to JNTUH, Approved by AICTE, Accredited by NAAC with A++ Grade, ISO 9001:2015 Certified  
Kacharam, Shamshabad, Hyderabad – 501218, Telangana, India

## DEPARTMENT OF MECHANICAL ENGINEERING

### List of Course Outcomes

R-22

Semester No:	I Year I Sem (R22)		
Course Title:	Matrices and Calculus	Course Code:	A8001
Course Outcome No.	Course Outcome Statement		
CO1	Solve system of linear equations using rank of a matrix.		
CO2	Examine the nature of quadratic form using eigen values and eigen vectors.		
CO3	Evaluate improper integrals using Beta and Gamma Functions.		
CO4	Examine the extremum of a function of several variables.		
CO5	Make use of multiple integrals to find the area and volume of a solid.		
Course Title:	Applied Physics	Course Code:	A8006
Course Outcome No.	Course Outcome Statement		
CO1	Analyze the properties of quantum computers by quantum physics.		
CO2	Apply wave property of light to study different optical phenomenon.		
CO3	Interpret the charge carrier dynamics in semiconductors.		
CO4	Develop communication systems by means of lasers and optical fibers		
CO5	Analyze the principles of nanoscience and technology for electronic applications.		
Course Title:	Problem Solving through C	Course Code:	A8501
Course Outcome No.	Course Outcome Statement		
CO1	Identify various building blocks to write a C program.		
CO2	Use control statements for solving a given problem.		
CO3	Write programs using arrays and strings to store and manipulate sequential data.		
CO4	Build programs with functions and structures for solving a complex problem.		
CO5	Make use of Pointers and Files to store and retrieve data efficiently.		
Course Title:	Engineering Materials	Course Code:	A8304
Course Outcome No.	Course Outcome Statement		
CO1	Classify the various materials that will be essential for the mechanical engineering applications.		
CO2	Express the mechanical properties of metals and their testing procedures.		

CO3	Illustrate the application of materials and their processing.		
CO4	Identify the requirement and need for the development of the new materials.		
CO5	Differentiate between Ferrous and Non ferrous materials and their alloys.		
<b>Course Title:</b>	Engineering Drawing	<b>Course Code:</b>	A8303
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Construct various types of curves commonly used in engineering practice.		
CO2	Describe the location of objects referring to the principal planes of projection.		
CO3	Create orthographic views of points, lines, planes and solids appropriate to the projection system in use.		
CO4	Develop the lateral surface areas of regular solids by construction methods.		
CO5	Generate 3-dimensional views of simple objects using isometric coordinates.		
<b>Course Title:</b>	Applied Physics Laboratory	<b>Course Code:</b>	A8007
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Evaluation of properties of light radiation by wave optics.		
CO2	Interpret the principles of semiconductors.		
CO3	Determine the properties of laser light and estimate losses in optical fibre.		
CO4	Analyze the VI characteristics of LED and solar cell.		
CO5	Apply resonance principle to calculate frequency of AC supply.		
<b>Course Title:</b>	Problem Solving through C Laboratory	<b>Course Code:</b>	A8502
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Use various programming constructs of C to solve a given problem.		
CO2	Make use of arrays, pointers and structures to organize data.		
CO3	Develop applications using functions for code reuse.		
CO4	Write programs using files for storing and accessing data.		
<b>Course Title:</b>	Engineering Workshop	<b>Course Code:</b>	A8301
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Identify the trade based materials and tools to prepare the models.		
CO2	Illustrate each trade and tool by hands on training in making the models.		
CO3	Apply different workshop practice methods towards workshop models.		
CO4	Analyze the trade based operations in the process of product development.		
CO5	Develop a progressive product towards a societal need.		
<b>Course Title:</b>	Social Innovation	<b>Course Code:</b>	A8021
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Develop awareness on social issues faced by local regions.		
CO2	Identify the mind set of human Race and interpret the societal issues as simple, complicated, and complex problems.		

CO3	Identify the need statement along with its main causes and effects.		
CO4	Develop an innovative and sustainable solution for social issues by thinking critically and creatively.		
<b>Semester No.</b>	<b>I Year II Semester(R22)</b>		
<b>Course Title:</b>	Ordinary Differential Equations and Vector Calculus	<b>Course Code:</b>	A8002
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Solve ordinary differential equations of first and higher order.		
CO2	Make use of ordinary differential equations to solve engineering problems.		
CO3	Apply Laplace transforms to solve ordinary differential equations.		
CO4	Determine divergence and curl of a vector point function.		
CO5	Make use of vector integral theorems to evaluate area, surface area and volumes.		
<b>Course Title:</b>	Engineering Chemistry	<b>Course Code:</b>	A8008
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Apply the knowledge of electrochemical series to protect different metals from corrosion.		
CO2	Analyze the hardness and other impurities present in the water for industrial and domestic applications.		
CO3	Evaluate the behaviour of different engineering materials.		
CO4	Analyze the different types of fossil fuels, characteristics and their applications.		
CO5	Compare the materials to study various physical and chemical properties.		
<b>Course Title:</b>	English for Skill Enhancement	<b>Course Code:</b>	A8010
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Build competence in grammar for effective communication.		
CO2	Acquire suitable vocabulary required for achieving communicative competence.		
CO3	Utilize academic reading skills to comprehend different texts effectively.		
CO4	Develop effective writing skills for academic purposes.		
CO5	Demonstrate basic proficiency in professional correspondence.		
<b>Course Title:</b>	Data Structures	<b>Course Code:</b>	A8505
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Select appropriate sorting and searching technique for a given application.		
CO2	Use various forms of linked lists to perform operations on data efficiently.		
CO3	Build applications using stack data structure for real time applications.		
CO4	Construct various forms of Queues to solve a real time problem.		
CO5	Make use of nonlinear data structures for organizing data.		
<b>Course Title:</b>	Engineering Mechanics	<b>Course Code:</b>	A8305
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Illustrate the types of forces and moments acting on a rigid body.		
CO2	Apply the laws of mechanics to evaluate different types of forces acting on a rigid body.		
CO3	Identify the centroid and moment of inertia of composite bodies.		

CO4	Apply the basic concepts of kinematics and kinetics to solve numerical problems.		
CO5	Calculate the forces and moments by using equilibrium conditions of a force system.		
<b>Course Title:</b>	Engineering Chemistry Laboratory	<b>Course Code:</b>	A8009
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Apply the instrumental techniques to find out the concentrations or equivalence points of solutions.		
CO2	Analyze the impurities present in the water using volumetric analysis.		
CO3	Make use of different titrations to measure various properties of chemical species.		
CO4	Analyze the importance of temperature and pressure on physical properties like viscosity and surface tension of liquids.		
CO5	Calculate the yield of synthetic drugs by maintaining specific reaction conditions.		
<b>Course Title:</b>	English Language and Communication Skills Laboratory	<b>Course Code:</b>	A8011
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Acquire the received pronunciation and speak in a neutral accent.		
CO2	Use contextual vocabulary for lucid spoken communication.		
CO3	Comprehend accent of different varieties of English.		
CO4	Develop skills for professional presentations.		
CO5	Demonstrate the ability to communicate by enhancing listening skills.		
<b>Course Outcome No.</b>	Data Structures Laboratory	<b>Course Code:</b>	A8507
<b>Course Title:</b>	<b>Course Outcome Statement</b>		
CO1	Implement various searching and sorting techniques on a given data.		
CO2	Organize data efficiently using linked lists.		
CO3	Perform various operations on data structures using arrays and linked lists.		
CO4	Write programs to traverse tree using linked list.		
<b>Course Title:</b>	Computer Aided Drawing	<b>Course Code:</b>	A8302
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Illustrate various menu bars and tool bars on AutoCAD interface.		
CO2	Differentiate first angle and Third angle projection system based on representation of orthographic views.		
CO3	Create orthographic views of points, lines, planes and solids using appropriate tools.		
CO4	Develop the lateral surface areas of regular solids by construction methods.		
CO5	Model 3-dimensional views of simple objects using isometric coordinates.		
<b>Course Title:</b>	Engineering Exploration	<b>Course Code:</b>	A8022
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Compare and contrast the contributions of different types of engineers in the development of a product, process, or system.		
CO2	Apply the common engineering design process to solve complex problems and arrive at viable solution.		
CO3	Explore various contemporary software and hardware tools to provide solutions for the problems.		

CO4	Apply skills needed for successful teamwork including the basics of project management and written and oral communication.		
CO5	Identify the key elements of professional codes of ethics as well as the ethical and societal issues related to the disciplines and their impact on society and the world.		
<b>Semester No.</b>	II Year I Semester		
<b>Course Title:</b>	Probability Distributions and Statistics	<b>Course Code:</b>	A8003
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Identify an appropriate probability distribution for a given discrete or continuous random variable and compute probabilities.		
CO2	Make use of probability distributions to analyze and solve a given problem.		
CO3	Interpret correlation coefficient in context and study regression analysis and apply the least square errors method numerically and algebraically to find the curve of best fit.		
CO4	Inspect scientific hypothesis and estimate confidence intervals at different levels.		
CO5	Compute P-value of a test statistics using component of hypothesis test.		
<b>Course Title:</b>	Material Science and Metallurgy	<b>Course Code:</b>	A8306
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Illustrate the basic principles of materials through crystal structure.		
CO2	Identify the phases and interrelationship between structure and properties of materials.		
CO3	Construct phase diagram of alloy systems at different temperatures and composition.		
CO4	Apply basic principles of ferrous and non-ferrous physical metallurgy for selection of materials.		
CO5	Analyze effect of heat treatment on material properties.		
<b>Course Title:</b>	Mechanics of Solids	<b>Course Code:</b>	A8307
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Demonstrate the concepts of stress and strain in structural members.		
CO2	Construct Shear force, Bending Moment diagrams for beams and Mohr's circle for plane stress.		
CO3	Determine the deflections and deformations of structural members.		
CO4	Analyze stresses in structural members		
CO5	Evaluate the mechanical properties of solid bodies subjected to various types of loading.		
<b>Course Title:</b>	Thermodynamics	<b>Course Code:</b>	A8308
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Develop an insight of the basic concepts of classical thermodynamics.		
CO2	Apply the laws of thermodynamics to solve engineering problems.		
CO3	Evaluate change in entropy for ideal and real gases.		
CO4	Solve problems using relationships of thermodynamic fluids.		
CO5	Analyze the performance of basic thermodynamic cycles.		
<b>Course Title:</b>	Material Science and Metallurgy Laboratory	<b>Course Code:</b>	A8309

<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Illustrate the basic principles of materials through crystal structure.		
CO2	Identify the phases and interrelationship between structure and properties of materials.		
CO3	Understanding metals and their use in industries.		
CO4	Apply basic principles of ferrous and non-ferrous physical metallurgy for selection of materials.		
CO5	Analyze effect of heat treatment on material properties.		
<b>Course Title:</b>	Mechanics of Solids Laboratory	<b>Course Code:</b>	A8310
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Test the mechanical properties of solid bodies subjected to various types of loading.		
CO2	Analyze the mechanical properties of solid bodies subjected to various types of loading.		
CO3	Determine the deflections and deformations of structural members.		
CO4	Calculate the strength of various structural members.		
CO5	Select the material for Industrial applications.		
<b>Course Title:</b>	Computer Aided Machine Drawing	<b>Course Code:</b>	A8311
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Identify product symbols, weld symbols, pipe joints by conventional representation.		
CO2	Illustrate various machine components through drawings as per ISO standards.		
CO3	Draw machine components by applying the principles of engineering drawing.		
CO4	Prepare the part or assembly drawings as per the conventions.		
CO5	Analyze part models and assembly drawings for developing 3D model.		
<b>Course Title:</b>	Engineering Design Thinking	<b>Course Code:</b>	A8023
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Interpret the problem-solving skills and product design skills.		
CO2	Apply foundational knowledge of the primary fields of engineering and scientific concepts to find sustainable solution.		
CO3	Customize the HCD model to the traditional engineering design process.		
CO4	Inspect the design and assess a prototype that solves real engineering problem.		
CO5	Expound the solutions for identified problems and document the findings/reflections for further design.		
<b>Course Title:</b>	Universal Human Values 2: Understanding Harmony	<b>Course Code:</b>	A8033
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Analyze the process of self-exploration, right understanding, relationships, natural acceptance for achieving ultimate happiness .		

CO2	Examine human being as a co-existence of self 'I' and the material 'Body'.		
CO3	Correlate the universal harmonious order in society, undivided society and from family to world family.		
CO4	Interpret the harmony in nature, holistic perception at all levels of existence.		
CO5	Analyze professional competence for augmenting universal human order, ethical human conduct for acceptance of human values.		
<b>Course Title:</b>	Gender Sensitization	<b>Course Code:</b>	A8031
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Interpret gender sensitization and problems of other genders		
CO2	Examine the reasons for the female feticide		
CO3	Attain a finer grasp of how gender discrimination works in our society and how to counter it.		
CO4	Develop sensitivity towards sexual and domestic violence		
CO5	Recognize gender sensitivity issues through literature and media.		
<b>Semester No.:</b>	<b>II Year-II Sem (R22)</b>		
<b>Course Title:</b>	Business Economics and Financial Analysis	<b>Course Code:</b>	A8013
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Examine the types of business and impact of macroeconomic variables on business.		
CO2	Analyze interrelationship among various economic variables and its impact.		
CO3	Classify the market structure to decide the fixation of suitable price.		
CO4	Apply accounting principles & rules for preparing financial statements.		
CO5	Analyze financial statements to assess financial health of business.		
<b>Course Title:</b>	Kinematics of Machinery	<b>Course Code:</b>	A8312
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Identify the various fundamental principles of kinematic pairs, chains and inversions.		
CO2	Summarize the functions of straight-line motion and steering mechanisms.		
CO3	Examine the velocity and acceleration diagram for different links of a given mechanism.		
CO4	Construct the cam profile for a given specified motions.		
CO5	Estimation of transmission of power by various power transmitting elements in real time practice.		
<b>Course Title:</b>	Thermal Engineering- I	<b>Course Code:</b>	A8313
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Compare air standard cycles with actual and fuel air cycles.		
CO2	Analyze combustion phenomenon in SI and CI engines.		
CO3	Analyze the performance parameters of internal combustion engines, compressors and gas turbines.		
CO4	Solve the problems related to internal combustion engines, compressors and gas turbines.		

CO5	Evaluate the performance of internal combustion engines and compressors		
<b>Course Title:</b>	Fluid Mechanics and Hydraulic Machines	<b>Course Code:</b>	A8314
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Determine various fluid properties and fluid flow types by using property functions.		
CO2	Solve fluid flow problems by applying continuity equation and Bernoulli's equation.		
CO3	Estimate energy losses and boundary layer parameters for laminar and turbulent flows.		
CO4	Analyze the hydrodynamic force of jets on stationary and moving vanes.		
CO5	Evaluate the performance parameters of hydraulic turbines and pumps		
<b>Course Title:</b>	Production Technology	<b>Course Code:</b>	A8315
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Explain the process of making patterns, preparation of sand mould, various special casting processes and casting defects.		
CO2	Select appropriate Joining methods to join Work pieces by using different weld ing techniques.		
CO3	Identify various metal forming processes for the various applications.		
CO4	Describe the properties and bonding techniques of plastics by using plastic molding techniques.		
CO5	Illustrate the various non-destructive testing methods for a specific application.		
<b>Course Title:</b>	Fluid Mechanics and Hydraulic Machines Laboratory	<b>Course Code:</b>	A8316
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Demonstrate the classical experiments in fluid mechanics and hydraulic machinery.		
CO2	Correlate various flow measuring devices such as Venturimeter and orifice me ter.		
CO3	Discuss the performance characteristics of turbines and pumps.		
CO4	Analyze the hydrodynamic force of jets on stationary and moving vanes		
CO5	Estimate energy losses and boundary layer parameters for laminar and turbulent flows.		
<b>Course Title:</b>	Thermal Engineering Laboratory	<b>Course Code:</b>	A8317
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Determine the valve timing diagram of SI engine and CI engine.		
CO2	Apply the concept of Morse test on SI engine.(multi cylinder).		
CO3	Experiment on IC engine load variations with Air fuel ratio.		
CO4	Calculate the performance characteristics of an Engine.		
CO5	Evaluate the performance of internal combustion engines and compressors.		
<b>Course Title:</b>	Production Technology Laboratory	<b>Course Code:</b>	A8318
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Demonstrate practical understanding of Moulding, melting and casting.		
CO2	Understand the Pattern design and making, casting drawing.		
CO3	Demonstrate practical understanding of Spot welding, TIG welding.		
CO4	Explain practical understanding of Hydraulic press, deep drawing and extrusion operation.		

CO5	Illustrate practical understanding of ARC welding lap and butt joint.		
<b>Course Title:</b>	Product Realization	<b>Course Code:</b>	A8024
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Interpret the specifications of product and solve for practical realization.		
CO2	Analyze the customers mind set and design the product.		
CO3	Develop Gantt chart to define timeline for product realization.		
CO4	Conceptualize the terms called product, purchase, production and monitoring of products.		
CO5	Communicate the process of converting an idea to physical product to the community		
<b>Course Title:</b>	Environmental Science and Technology	<b>Course Code:</b>	A8032
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Illustrate the important components of environment.		
CO2	Identify global environmental problems to come out with best possible solutions.		
CO3	Make use of environmental laws for the protection of forest and wildlife.		
CO4	Apply environmental ethics to maintain harmonious relation between nature and human being.		
CO5	Analyse the major environmental effects of exploiting natural resources.		
<b>Semester No:</b>	<b>III Year-I Sem (R22)</b>		
<b>Course Title:</b>	Dynamics of Machinery	<b>Course Code:</b>	A8319
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Compute frictional losses, torque transmission of mechanical systems		
CO2	Illustrate the effect of forces on different Machine members		
CO3	Analyze balancing problems in rotating and reciprocating machinery		
CO4	Analyze stabilization of sea vehicles, aircrafts and automobile vehicles		
CO5	Determine the natural frequencies of continuous systems starting from the general equation of displacement.		
<b>Course Title:</b>	Metrology and Machine Tools	<b>Course Code:</b>	A8320
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Identify the important elements of metal cutting including advanced machinery		
CO2	Apply the machining process on work piece under automatic and semiautomatic machines		
CO3	Estimate the machining time of various machines and tools.		
CO4	Solves problems involving machining operations.		
CO5	Analyze the performance of machine tools.		
<b>Course Title:</b>	Design of Machine Elements	<b>Course Code:</b>	A8321
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Apply the mechanism of the theories of failure to structural members at various loading conditions.		
CO2	Design different kinds of mechanical joints (rivet and weld) based on strength.		

CO3	Analyze the components and working principle of cotter and knuckle joint.
CO4	Develop the knowledge of power transmission in shafts.
CO5	Determine the stress and deflection of springs at various operating condition.
<b>Course Title:</b>	Thermal Engineering II <b>Course Code:</b> A8322
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>
CO1	Analyze steam power cycle performance using thermodynamic properties
CO2	Compare the flow through nozzles to decide nozzle shape
CO3	Evaluate the operating parameters of steam turbines
CO4	Solve steam turbine problems through velocity triangle concepts
CO5	Estimate the refrigeration capacity by applying thermodynamic principles
<b>Course Title:</b>	Metrology and Machine Tools Laboratory <b>Course Code:</b> A8323
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>
CO1	Impart practical exposure to the metrology equipment & Machine Tools
CO2	Conduct experiments and understand the working of the same
CO3	Hands on experience on lathe machine to perform turning, facing, threading operations.
CO4	Practical exposure on flat surface machining, milling and grinding operations
CO5	Skill development in drilling and threading operations, Linear and angular measurements exposure
<b>Course Title:</b>	Dynamics of Machinery Laboratory <b>Course Code:</b> A8324
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>
CO1	Define the basics of mechanism and their inversions and able to show the displacement, velocity and acceleration in different mechanisms
CO2	Apply different principles and methods for kinematic and dynamic analysis of mechanisms
CO3	Classify cams and followers & analyze the cam design
CO4	Elaborate different modes of power transmission and use of friction in power transmission
CO5	Classify different types of gears and evaluate their working in various gear trains. Also make use of balancing and vibration in mechanical systems
<b>Course Title:</b>	Engineering Design Laboratory <b>Course Code:</b> A8325
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>
CO1	Determine the deflection, whirling speed and stress of different structures
CO2	Analyze the transverse vibration of different beam set up
CO3	Evaluate the compressive, tensile and buckling of 3-D printed structures
CO4	Estimate the natural frequency of dynamic system

CO5	Calculate the natural frequencies and amplitudes of mechanical components.		
<b>Course Title:</b>	Indian Constitution	<b>Course Code:</b>	A8034
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Identify the important components of Indian Constitution.		
CO2	Apply the fundamental rights in right way and become a more responsible citizen.		
CO3	Illustrate the evolution of Indian Constitution.		
CO4	Identify the basic structure of Indian Constitution.		
CO5	Relate the basic concepts of democracy, liberty, equality, secular and justice.		
<b>Course Title:</b>	Automation in Manufacturing	<b>Course Code:</b>	A8353
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Illustrate the basic concepts of automation in machine tools		
CO2	Analyze various automated flow lines, Explain assembly systems and line balancing methods		
CO3	Describe the importance of automated material handling and storage systems		
CO4	Interpret the importance of adaptive control systems, automated inspection systems		
CO5	Apply the concepts of image processing applications of machine vision		
<b>Semester No.</b>	<b>III Year II Semester (R22)</b>		
<b>Course Title:</b>	Heat Transfer	<b>Course Code:</b>	A8326
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Solve heat and mass transfer problems by applying basic laws and principles		
CO2	Analyze steady and transient state heat conduction problems using correlations		
CO3	Evaluate heat transfer coefficient by applying convective heat transfer concepts		
CO4	Compare heat exchanger performance for various types of fluid flows		
CO5	Estimate radiation heat transfer by using emission characteristics of objects.		
<b>Course Title:</b>	Machine Design	<b>Course Code:</b>	A8327
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Apply the design aspects of gears used in mechanical drives		
CO2	Estimate the effective strength of gears based on dynamic and wear criterion's		
CO3	Analyze the design procedure of different components used in IC engine		
CO4	Demonstrate the working principle of brakes and clutches in locomotive		
CO5	Explain the functions of bearing and its selection		
<b>Course Title:</b>	Finite Element Methods	<b>Course Code:</b>	A8328
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Illustrate the general procedure of finite element method, one dimensional problems and shape functions.		
CO2	Solve structural elements including trusses and beams.		
CO3	Apply finite element method to solve two dimensional and axi-symmetric problems		

CO4	Analyze heat transfer in 1D and 2D problems
CO5	Simulate the dynamic analysis of the components as per the boundary conditions
<b>Course Title:</b>	Heat Transfer Laboratory <b>Course Code:</b> A8329
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>
CO1	Estimate the thermal conductivity of different materials
CO2	Determine the heat transfer coefficient in transient heat conduction
CO3	Correlate the heat transfer coefficients in natural and forced convection
CO4	Analyze the performance of heat pipe and double pipe heat exchanger
CO5	Compare the emissivity of the test plate with the black plate
<b>Course Title:</b>	Automobile Engineering (PE- II) <b>Course Code:</b> A8355
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>
CO1	Distinguish various subsystems and components of automobile and electric vehicle.
CO2	Analyze the engine ignition and transmission system of automobile
CO3	Categorize energy storage devices and cooling system components of automobile.
CO4	Classify braking systems and steering mechanisms used in automobile
CO5	Identify the influence of suspension system used in automobile
<b>Course Title:</b>	Composite Materials (PE-III) <b>Course Code:</b> A8360
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>
CO1	Identify with the specifics of mechanical behavior of layered composites compared to isotropic materials
CO2	Apply constitutive equations of composite materials and understand mechanical behavior at micro, macro and meso level
CO3	Determine stresses and strains in composites
CO4	Analyze failure criteria and critically evaluate the results
CO5	Recognizes the mechanical behavior of composites due to variation in temperature and moisture
<b>Course Title:</b>	Numerical Simulation Laboratory <b>Course Code:</b> A8330
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>
CO1	Illustrate the stress effect on the components
CO2	Analyze the deflections occurring on the beams
CO3	Examine the 2D problems under different boundary conditions
CO4	Compare the heat transfer problems
CO5	Formulate MATLAB code for the mechanical applications
<b>Course Title:</b>	Internship <b>Course Code:</b> A8041
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>
CO1	Insight interested area in the industry to assimilate engineering knowledge.
CO2	Understand industrial machine tools working principle to develop products.
CO3	Apply engineering approach effectively to simplify and solve complex engineering problems.
CO4	Empower team skills by inducing the general awareness and work place behaviour

	among team members.		
CO5	Write technical reports on innovative methods adopted for industrial development.		
<b>Course Title:</b>	Miniproject	<b>Course Code:</b>	A8041
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Demonstrate presentation and communication skills.		
CO2	Compare the theoretical approach with the practical approach in the industry.		
CO3	Identify the gaps, issues and directions for future applications.		
CO4	Develop problem solving skills and industrial expertise in specific domain.		
CO5	Conclude the idea of expertise in the industry in the form of presentation and documentation.		
<b>Course Title:</b>	Research Methodology	<b>Course Code:</b>	A8035
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Identify an appropriate research problem in their suitable domain.		
CO2	Explain the concepts and procedures of sampling, data collection, analysis, and reporting.		
CO3	Analyze the complex issues inherent in selecting a research problem, research design, and implementing a research project.		
CO4	Construct a well-structured research paper and scientific presentations.		
CO5	Express the importance of research ethics in the scientific community.		
<b>Semester No.</b>	<b>IV Year I Semester (R22)</b>		
<b>Course Title:</b>	Instrumentation and Control Systems	<b>Course Code:</b>	A8332
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Know the basic knowledge of the functional blocks of measurement systems		
CO2	Describe the working of various physical variable Temperature and pressure measuring instruments		
CO3	Explain the working of various physical variable Level, flow, Speed and Acceleration measuring instruments		
CO4	Understand the working of various physical and Electrical variables Stress, Humidity, Force, Torque and Power measuring instruments		
CO5	Understand the concept of control system and calculate transfer functions of mechanical and Translational systems with different techniques		
<b>Course Title:</b>	CIM and Robotics	<b>Course Code:</b>	A8333
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Explain CIM and robotics system, it's classification and design guidelines		
CO2	Describe CIM implementation process and system troubleshooting		
CO3	Apply suitable sensors to the work cell and summarize the work-cell support system		
CO4	Illustrate work-cell controller programming and system integration		

CO5	Analyze and justify the capital equipment in work-cell system and case studies of work-cell design		
<b>Course Title:</b>	Renewable Energy Sources (PE-IV)	<b>Course Code:</b>	A8365
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Understand the energy strategy and the importance of energy conservation.		
CO2	Apply solar energy techniques to domestic applications		
CO3	Classify hydro power and wind energy conversion systems based on orientation		
CO4	Identify biomass and urban waste energy conversion techniques		
CO5	Compare the tidal, ocean thermal and geothermal energy resources for utilization.		
<b>Course Title:</b>	Unconventional Machining Processes (PE-V)	<b>Course Code:</b>	A8369
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Illustrate the significance of the modern machining processes		
CO2	Identify the latest machining technologies for Innovations		
CO3	Gain Knowledge of metal removal mechanism for various machining techniques		
CO4	Selection of machining process for various work materials		
CO5	Apply suitable machining process for the typical component		
<b>Course Title:</b>	Management Science (OE-I)	<b>Course Code:</b>	A8086
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Explain and infer the concepts and aspects of management		
CO2	Analyze the contributions of management, organizational structures, plant layouts, work study tools for enhancement of productivity in an organization		
CO3	Apply the project management techniques to decide the optimum time and cost for completion of a project.		
CO4	Apply statistical quality control & Inventory control techniques to manage and control products and materials.		
CO5	Use Human resource management techniques for better people management		
<b>Course Title:</b>	Instrumentation Laboratory	<b>Course Code:</b>	A8334
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Calibration of Pressure Gauges, temperature, LVDT, capacitive transducer, rotameter		
CO2	use of various source of measurement by measuring instruments with precision		
CO3	Characterize and calibrate measuring devices		

CO4	Identify and analyze errors in measurement		
CO5	Analyze measured data using regression analysis		
<b>Course Title:</b>	CIM and Robotics Laboratory	<b>Course Title:</b>	A8335
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Apply basic maintenance procedures for CNC Lathe machines, including routine checks, lubrication, and minor repairs to ensure optimal machine performance		
CO2	Develop the ability to write, edit, and troubleshoot CNC programs using G-code		
CO3	Explain the selection and use of cutting tools, as well as the principles of work-holding devices, fixtures, and tool changes in CNC Milling machining		
CO4	Analyze the kinematics of Robot		
CO5	Demonstrate the working of Robot Arm		
<b>Course Title:</b>	Project Work Phase – I	<b>Course Code:</b>	A8042
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Demonstrate a sound technical knowledge in the selected project work area.		
CO2	Apply critical and creative thinking in the design of engineering projects.		
CO3	Identify and address the societal issues in their domain in commensuration with the professional ethics.		
CO4	Design and develop mechanical systems to solve engineering problems through innovative approaches.		
CO5	Illustrate new projects outlining the approach and expected results using power point presentation.		
<b>Semester No.</b>	<b>IV Year II Sem (R22)</b>		
<b>Course Title:</b>	Total Quality Management (PE-VI)	<b>Course Code:</b>	A8374
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Discuss quality, total quality management(TQM) and quality systems for better quality		
CO2	Evaluate quality using Statistical Tools		
CO3	Choose TQM methodologies for continuous improvement of Quality		
CO4	Utilize TQM tools for Quality Control		
CO5	Analyse various inventory control models for effective management of materials		
<b>Course Title:</b>	Solar Energy and Applications(OE-II)	<b>Course Code:</b>	A8281
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Compare the present and future available electrical power from solar energy based on the knowledge of global solar horizontal irradiation.		

CO2	Assimilate and acquire the skills for design and engineering of solar thermal and solar photovoltaic technology and systems.		
CO3	Identify the problems involved in solar thermal energy conversion technique used in the solar heating and cooling systems for buildings/societal needs.		
CO4	Examine the components of a solar photo voltaic system and their function by utilizing the previous literature knowledge on different photovoltaic solar cells.		
CO5	Analyze the techno-economics performance and issues in the solar energy system.		
<b>Course Title:</b>	Entrepreneurship Development (OE-III)	<b>Course Code:</b>	A8084
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Identify the role, characteristics, qualities and functions of entrepreneur.		
CO2	Interpret various Institutional supports for setting up a business enterprise.		
CO3	Illustrate role, importance and functions of women entrepreneur.		
CO4	Infer the concept of Project Management and steps in Project development.		
CO5	Indicate training programs and different training institutions to impart training		
<b>Course Title:</b>	Project Work Phase - II	<b>Course Code:</b>	A8043
<b>Course Outcome No.</b>	<b>Course Outcome Statement</b>		
CO1	Identify the problem and prepare objective statement based on literature survey in the specialized domain.		
CO2	Demonstrate methodology indicating all steps on selected project by articulating technical terms and tools.		
CO3	Build experimental setup based on designed process and instrumentation in the project.		
CO4	Validate the experimental results by correlating with the existing results in the literature		
CO5	Record and prepare the report to make the overall presentation of the project.		

**HOD, MEC**