



VARDHAMAN
COLLEGE OF ENGINEERING

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-25

Semester No:	I Year-I Sem		
Course Title:	Matrices and Calculus	Course Code:	A9001
Course Outcome No.	Course Outcome Statement		
CO1	Solve system of equations using rank of a matrix.		
CO2	Construct the canonical form of a quadratic form using orthogonal transformations.		
CO3	Express a function in series by mean value theorems and evaluate improper integrals using Beta and Gamma functions		
CO4	Examine the extremum of a function of several variables.		
CO5	Apply multiple integrals to find the areas and volumes.		
Course Title:	Engineering Chemistry	Course Code:	A9009
Course Outcome No.	Course Outcome Statement		
CO1	Analyse the hardness and other impurities present in the water for industrial and domestic applications.		
CO2	Apply electrochemical principles to protect the metals from corrosion.		
CO3	Illustrate the types of energy sources along with their characteristics and applications.		
CO4	Differentiate the properties of various polymeric materials based on their structure and engineering applications.		
CO5	Compare the materials to study various physical and chemical properties.		
Course Title:	Programming for Problem Solving	Course Code:	A9501
Course Outcome No.	Course Outcome Statement		
CO1	Use basic programming constructs and control statements to design solutions for computational problems		
CO2	Develop programs using arrays and strings to store and manipulate sequential data.		
CO3	Implement modular programming using functions, structures, and unions to manage complex problems and data.		
CO4	Make use of pointers and file handling to electively manage and process data.		
CO5	Choose appropriate searching and sorting technique to organize and retrieve data efficiently.		
Course Title:	English for Skill Enhancement	Course Code:	A9011
Course Outcome No.	Course Outcome Statement		

CO1	Identify and use appropriate vocabulary to compose and deliver clear oral and written communication.		
CO2	Practice adept usage of grammar for effective communication		
CO3	Interpret and summarize known and unknown passages		
CO4	Develop proficiency in writing for academic purposes.		
CO5	Demonstrate basic proficiency in professional correspondence		
Course Title:	Engineering Drawing	Course Code:	A9301
Course Outcome No.	Course Outcome Statement		
CO1	Construct various types of engineering scales and curves used in technical drawings.		
CO2	Interpret and create orthographic projections of points, lines, and planes with varying inclinations.		
CO3	Generate orthographic views of regular solids, inclined to one or both reference planes.		
CO4	Analyze sectional views of regular solids to construct true shape of the section, and lateral surface development.		
CO5	Produce isometric views of objects and convert between isometric and orthographic projections.		
Course Title:	Engineering Chemistry Laboratory	Course Code:	A9010
Course Outcome No.	Course Outcome Statement		
CO1	Apply the instrumental techniques to find out the strength of solutions.		
CO2	Analyze the impurities present in the water using volumetric analysis.		
CO3	Make use of different titrimetric methods to measure chemical species..		
CO4	Analyze the importance of temperature and pressure on physical properties of liquids.		
CO5	Calculate the yield of synthesized compounds by maintaining appropriate reaction conditions		
Course Title:	Programming for Problem Solving Laboratory	Course Code:	A9502
Course Outcome No.	Course Outcome Statement		
CO1	Make use of fundamental programming constructs to develop solutions for computational problems.		
CO2	Perform various operations on arrays and strings to effectively organize, process, and manipulate sequential data in programs		
CO3	Develop programs with functions and structures to design modular programs that efficiently handle and process data.		
CO4	Apply pointers and file handling techniques to implement programs for storing and managing data effectively		
CO5	Implement searching and sorting algorithms to efficiently organize and access data.		
Course Title:	English Language and Communication Skills Laboratory	Course Code:	A9012
Course Outcome No.	Course Outcome Statement		
CO1	Acquire the received pronunciation and speak in a neutral accent		
CO2	Use language effectively in real-life situations		
CO3	Demonstrate effective use of non verbal communication		

CO4	Interpret visual data for oral communication		
CO5	Develop the ability to enhance listening skills		
Course Title:	Engineering Workshop	Course Code:	A9302
Course Outcome No.	Course Outcome Statement		
CO1	Demonstrate the ability to perform fundamental workshop trades, including cutting, carpentry, welding, and plumbing, by completing a variety of hands-on tasks.		
CO2	Demonstrate safe and effective usage of fabrication tools and digital equipment.		
CO3	Identify and operate common workshop machines and tools while strictly adhering to safety protocols and quality management practices.		
CO4	Recognize the properties of different materials and select appropriate tools and processes for specific manufacturing applications		
CO5	Fabricate a complete, functional assembly by integrating multiple skills learned across different workshop trades.		
Course Title:	Community Centered Design Thinking	Course Code:	A9021
Course Outcome No.	Course Outcome Statement		
CO1	Apply the principles of design thinking, empathy, and sustainability to identify and understand real-world community challenges.		
CO2	Conduct field research surveys and observation to define community-based problem statements.		
CO3	Ideate creative solutions using appropriate tools and techniques to meet the identified community needs.		
CO4	Collaborate with community members, NGOs, and peers to test, refine, and validate design solutions through feedback and co-design processes.		
CO5	Communicate design outcomes effectively through documentation, storytelling, and ethical reflection considering accessibility, inclusivity, and life-cycle impact.		
Semester No:	I Year-II Sem		
Course Title:	Ordinary Differential Equations and Vector Calculus	Course Code:	A9002
Course Outcome No.	Course Outcome Statement		
CO1	Make use of first order differential equations to solve real world problems.		
CO2	Solve ordinary differential equations of higher order.		
CO3	Apply Laplace transforms to solve ordinary differential equations.		
CO4	Determine divergence and curl of a vector point function.		
CO5	Compute line, surface, and volume integrals and convert them into one another using appropriate theorems.		
Course Title:	Engineering Physics	Course Code:	A9007
Course Outcome No.	Course Outcome Statement		
CO1	Apply quantum mechanical principles to understand the particle behavior and formation of energy bands in solids.		
CO2	Analyze semiconductor properties and explain the operation of P-N junction diode and their applications.		
CO3	Apply quantum gates to design quantum circuits and implement fundamental quantum algorithms.		
CO4	Analyze magnetic and dielectric properties relevant to modern technological applications.		
CO5	Apply laser and fibre optic principles to communication and sensing technologies.		
Course Title:	Engineering Mechanics	Course Code:	A9303

Course Outcome No.	Course Outcome Statement		
CO1	Apply fundamental principles of force systems, including resultants, moments, and equilibrium in 2D and 3D force systems.		
CO2	Analyze different types of frictional forces, including static and dynamic friction, and solve problems involving ladder and wedge friction.		
CO3	Determine the centroid and center of gravity of simple and composite bodies using _rst principles and Pappus's theorems		
CO4	Calculate moment of inertia and mass moment of inertia for standard and composite sections, applying theorems of moments of inertia.		
CO5	Apply principles of work-energy and impulse-momentum to analyze the motion of particles and evaluate results of central collisions		
Course Title:	Data Structures	Course Code:	A9503
Course Outcome No.	Course Outcome Statement		
CO1	Make use of programming constructs, Templates and STL components to implement data structures and solve computational problems effectively.		
CO2	Implement linked list data structures using abstract data types to perform various operations.		
CO3	Implement stack and queue abstract data types for solving applications on linear data.		
CO4	Choose an appropriate nonlinear data structure for representing and solving real world problems.		
CO5	Examine hashing and dictionary structures for insertion, deletion, and searching in computational problems.		
Course Title:	Basic Electrical and Electronics Engineering	Course Code:	A9209
Course Outcome No.	Course Outcome Statement		
CO1	Use circuit laws and reduction methods to determine voltages, currents, and other parameters in simple DC and AC circuits		
CO2	Apply the principles of DC machines to determine its parameters and characteristics.		
CO3	Apply the concept of AC machines to determine the parameters and characteristics of transformers and induction machines.		
CO4	Apply electrical drive principles to select and operate drives for mechanical systems based on load requirements		
CO5	Apply the switching principle of diode and SCR to understand the significance of rectifier circuits for practical applications		
Course Title:	Engineering Physics Laboratory	Course Code:	A9008
Course Outcome No.	Course Outcome Statement		
CO1	Determine key parameters of LEDs and solar cells from their IV characteristics.		
CO2	Apply the Hall Effect to determine the type of semiconductor and estimate the density of majority charge carriers.		
CO3	Evaluate material properties including energy band gap, magnetic moment, dielectric constant, and magnetic hysteresis behavior		
CO4	Apply the principles of lasers and optical fibres to determine laser wavelength and Numerical Aperture.		
CO5	Apply principles of mechanical waves to determine AC supply frequency.		
Course Title:	Data Structures Laboratory	Course Code:	A9504
Course Outcome No.	Course Outcome Statement		
CO1	Implement programs that efficiently manage and manipulate data using dynamic programming techniques in C++.		
CO2	Apply various linked list techniques to perform insertion, deletion and traversal on given data		
CO3	Develop programs using linear data structures stack and queue to handle data processing		

	tasks efficiently.		
CO4	Implement nonlinear data structures to solve real time applications		
CO5	Choose appropriate hashing and dictionary methods to efficiently store, retrieve, and manipulate data.		
Course Title:	Computer Aided Machine Drawing	Course Code:	A9305
Course Outcome No.	Course Outcome Statement		
CO1	Develop the concept of projection principles to draw machine components using AutoCAD		
CO2	Prepare 2D drawings of joints like cotter, pin, riveted, welded, and couplings.		
CO3	Interpret detailed-part drawings of machine components as per BIS standards		
CO4	Model and assemble machine components using Fusion 360.		
CO5	Develop 3D assemblies of valves, engine parts, and machine tool parts.		
Course Title:	Product Design and Development	Course Code:	A9022
Course Outcome No.	Course Outcome Statement		
CO1	Explain the principles of product design and the product development life cycle, with an emphasis on addressing real-world community needs		
CO2	Generate and evaluate innovative product concepts using relevant Hardware and Software design tools		
CO3	Develop functional prototypes using appropriate prototyping tools, and perform initial testing and validation		
CO4	Refine prototypes through iterative feedback loops, integrating sustainability and user-centered design principles		
CO5	Document and communicate product designs effectively with comprehensive specifications and user manuals tailored for community stakeholders		
Course Title:	II Year-I Sem (R20)		
Course Outcome No.	Business Economics and Financial Analysis	Course Code:	A9014
Course Title:	Course Outcome Statement		
CO1	Analyze business and economic concepts to assess their impact on the overall economic environment.		
CO2	Examine the relationship between demand, supply, and elasticity in understanding market behavior.		
CO3	Apply production, cost, market structure, and pricing concepts to interpret business operations and competitive strategies.		
CO4	Apply accounting principles and rules for preparing nancial statements.		
CO5	Analyze nancial statements and capital budgeting techniques to evaluate the nancial health of a business.		
Course Title:	Material Science and Metallurgy	Course Code:	A9306
Course Outcome No.	Course Outcome Statement		
CO1	Implement crystallographic principles to construct and describe lattice types, unit cells, crystal orientations, and defect structures.		
CO2	Evaluate phase diagrams using the Lever Rule and identify transformations in alloy systems such as eutectic and peritectic reactions.		
CO3	Execute standard heat treatment processes and assess their impact on microstructure and properties of ferrous alloys.		
CO4	Compare the structures and properties of various cast irons and steels for di erent engineering applications.		

CO5	Select appropriate non-ferrous metals, ceramics, and composites for specific applications based on structural and functional properties.		
Course Title:	Production Technology	Course Code:	A9307
Course Outcome No.	Course Outcome Statement		
CO1	Identify 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 welding techniques.		
CO3	Analyze various metal forming processes for the various applications		
CO4	Analyze the properties and bonding techniques of plastics by using plastic molding techniques.		
CO5	Illustrate the various non-destructive testing methods for a specific application.		
Course Title:	Mechanics of Solids	Course Code:	A9308
Course Outcome No.	Course Outcome Statement		
CO1	Apply the fundamental concepts of stress, strain, and elastic constants to analyze bars of uniform and varying sections, composite members, and thermal stresses.		
CO2	Construct shear force and bending moment diagrams for various types of beams under different loading conditions and relate them to the rate of loading.		
CO3	Evaluate bending and shear stresses in beams of different cross sections and design simple beam sections for strength.		
CO4	Analyze principal stresses and strains using analytical methods and Mohr's circle, and apply theories of failure to predict safe loading conditions.		
CO5	Examine torsional behavior of shafts and stresses in thin and thick cylinders under internal and external pressures using torsion theory and Lamé's equations.		
Course Title:	Thermodynamics	Course Code:	A9309
Course Outcome No.	Course Outcome Statement		
CO1	Describe thermodynamic systems and processes using basic concepts and laws.		
CO2	Analyze steady and unsteady systems using the First Law of Thermodynamics.		
CO3	Apply Second Law to evaluate the efficiency of heat engine, refrigerator and heat pump.		
CO4	Interpret the behavior of pure substances and apply thermodynamic relations.		
CO5	Compare air standard power cycles in terms of thermal efficiency and performance.		
Course Title:	Production Technology Laboratory	Course Code:	A9310
Course Outcome No.	Course Outcome Statement		
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	Apply practical understanding of Hydraulic press, deep drawing and extrusion operation.		
CO5	Illustrate practical exposure of ARC welding lap and butt joint.		
Course Title:	Material Science and Mechanics of Solids Laboratory	Course Code:	A9311
Course Outcome No.	Course Outcome Statement		

CO1	Understand and evaluate material behaviour under axial and torsional loading.		
CO2	Analyse deflection and stiffness of structural members and springs.		
CO3	Assess material performance under compressive and impact loading.		
CO4	Investigate the crystallography and phase structures of steel and their influence on properties.		
CO5	Evaluate microstructural differences and their impact on hardenability and alloy behaviour.		
Course Title:	Full Stack Development	Course Code:	A9603
Course Outcome No.	Course Outcome Statement		
CO1	Apply the structure and semantics of HTML.		
CO2	Design and Style web pages using CSS for layout and design.		
CO3	Develop interactive Client-side web pages with objects, events, error handling and form validation.		
CO4	Create dynamic web applications by using JSON for data analysis and establish database connection using JDBC.		
CO5	Build responsive full stack web applications integrating front-end, back-end, and database connectivity.		
Course Title:	Drafting and Modelling	Course Code:	A9312
Course Outcome No.	Course Outcome Statement		
CO1	Understand and Navigate CATIA Interface.		
CO2	Create and Constrain 2D Sketches to create detailed 2D sketches using pro le and operation tools, apply geometric and dimensional constraints.		
CO3	Develop 3D Models of Machined Components for model complex parts using material addition and removal features.		
CO4	Apply Multibody and Boolean Techniques in design transformations, parameters, and design tables for advanced part design and automation.		
CO5	Design and Modify Surface Models for Plastic Components.		
Course Title:	Technology Entrepreneurship	Course Code:	A9023
Course Outcome No.	Course Outcome Statement		
CO1	Identify and analyze market opportunities for community-driven technological innovations.		
CO2	Apply intellectual property strategies for protecting product designs and innovations.		
CO3	Develop sustainable and scalable business models for product commercialization.		
CO4	Formulate funding, financial, and go-to-market strategies for product launch.		
CO5	Prepare and deliver investor-ready pitches or patent documentation to relevant stakeholders.		
Semester No.	II Year II Semester		
Course Title:	Probability Distributions and Statistics	Course Code:	A9004
Course Outcome No.	Course Outcome Statement		
CO1	Identify an appropriate probability distribution for a given discrete or continuous random variable.		
CO2	Make use of probability distributions to analyze and solve a given problem.		
CO3	Interpret correlation coefficient and perform regression analysis to t the best curve.		

CO4	Inspect scientific hypothesis and estimate confidence intervals at different levels.		
CO5	Compute P-value of a test statistic using component of hypothesis test.		
Course Title:	Kinematics of Machinery	Course Code:	A9313
Course Outcome No.	Course Outcome Statement		
CO1	Identify the principles of kinematic links, pairs, and their classification, Inversions and planar mechanisms.		
CO2	Select planar four bar and slider crank mechanisms for specified kinematic conditions.		
CO3	Analyze the planar mechanisms for position, velocity and acceleration.		
CO4	Choose the cams and followers for specified motion profiles.		
CO5	Evaluate gear tooth geometry and select appropriate gears for the required applications.		
Course Title:	Thermal Engineering- I	Course Code:	A9314
Course Outcome No.	Course Outcome Statement		
CO1	Interpret the operating principles and classification of IC engines and assess losses in actual cycles with respect to ideal cycles.		
CO2	Differentiate combustion characteristics and influencing variables in SI and CI engines, including modern ignition and injection systems.		
CO3	Examine engine test results and derive performance parameters using standard measurement techniques and heat balance analysis.		
CO4	Compute the work input and efficiency of reciprocating and centrifugal air compressors under different operating conditions.		
CO5	Evaluate the performance and efficiency of gas turbines by analyzing Brayton cycle improvements and material considerations.		
Course Title:	Fluid Mechanics and Hydraulic Machines	Course Code:	A9315
Course Outcome No.	Course Outcome Statement		
CO1	Utilize the laws of fluid statics to estimate pressure using instruments such as piezometers and differential manometers.		
CO2	Examine various flow regimes by evaluating streamline behavior and applying energy and momentum principles.		
CO3	Determine pressure losses in piping networks using theoretical formulas like Darcy-Weisbach and recognize losses in compound flows		
CO4	Interpret the interaction of jets with vanes through velocity diagrams and compute the power transmitted and efficiency.		
CO5	Use operational concepts to evaluate the efficiency and functionality of hydraulic turbines and pumping systems.		
Course Title:	Metrology and Machine Tools	Course Code:	A9316
Course Outcome No.	Course Outcome Statement		
CO1	Utilize precision measuring instruments to ensure dimensional accuracy.		
CO2	Execute fundamental machining operations on lathes and milling machines.		
CO3	Operate and maintain various machine tools for specific tasks.		

CO4	Apply quality control and alignment techniques to achieve high-precision outputs.		
CO5	Analyze and verify the surface finish of a component using instruments like a surface roughness tester, and relate the results to the machining process used.		
Course Title:	Fluid Mechanics and Hydraulic Machines Laboratory	Course Code:	A9317
Course Outcome No.	Course Outcome Statement		
CO1	Demonstrate the classical experiments in fluid mechanics and hydraulic machinery.		
CO2	Correlate various flow measuring devices such as Venturimeter and orifice meter.		
CO3	Discuss the performance characteristics of turbines and pumps.		
CO4	Estimate energy losses and boundary layer parameters for laminar and turbulent flows.		
CO5	Demonstrate the classical experiments in fluid mechanics and hydraulic machinery.		
Course Title:	Thermal Engineering Laboratory	Course Code:	A9318
Course Outcome No.	Course Outcome Statement		
CO1	Analyze the performance characteristics of a diesel engine through load, motoring, and heat balance tests.		
CO2	Evaluate the efficiency of various petrol engines including two-stroke, four-stroke, and VCR engines.		
CO3	Interpret power measurement results from Morse and Compressor tests to determine output and efficiency.		
CO4	Draw and examine valve and port timing diagrams to understand engine operation and phase relationships.		
CO5	Perform mechanical diagnostics including engine dismantling and viscosity testing using standard instruments.		
Course Title:	Metrology and Machine Tools Laboratory	Course Code:	A9319
Course Outcome No.	Course Outcome Statement		
CO1	Develop proficiency in precision measurement techniques and dimensional inspection.		
CO2	Apply alignment testing and surface quality to maintain and improve machine tool performance.		
CO3	Develop hands-on skills in performing various turning, tapering, threading, and knurling operations on a lathe machine.		
CO4	Practical exposure on at surface machining, drilling and grinding operations.		
CO5	Understand different machining techniques to produce Gear Profiles, key ways with desired shapes.		
Course Title:	Computational Mathematics Laboratory	Course Code:	A9006
Course Outcome No.	Course Outcome Statement		
CO1	Develop the code to find the Eigen values and Eigen Vectors using Python/MATLAB		
CO2	Develop the code to find solution of Algebraic and Transcendental using Python/MATLAB		
CO3	Develop the code to find solution of Linear system of equations using Python/MATLAB		
CO4	Write the code to solve problems of First-Order linear differential equations with constant coefficients		
CO5	Write the code to solve problems of Higher order linear differential equations with		

	constant coefficients		
Course Title:	Rapid Prototyping	Course Code:	A9320
Course Outcome No.	Course Outcome Statement		
CO1	Understand the principles and workflow of rapid prototyping technologies.		
CO2	Operate polymer and ceramic 3D printers for part fabrication.		
CO3	Prepare 3D CAD models and slice them for printing.		
CO4	Post process printed parts (for both polymer and ceramics).		
CO5	Evaluate dimensional accuracy and mechanical performance of printed parts.		
Course Title:	Community Driven Product Evaluation	Course Code:	A9024
Course Outcome No.	Course Outcome Statement		
CO1	Apply structured evaluation frameworks to assess technical, functional, and social impact of products.		
CO2	Conduct community-centered product testing and collect actionable feedback.		
CO3	Benchmark products against industry standards and competitor solutions.		
CO4	Analyze evaluation data to identify strengths, weaknesses, and areas for improvement.		
CO5	Integrate knowledge from all prior courses to produce a comprehensive commercialization or patent readiness report.		

HoD, MEC