



**VARDHAMAN**  
COLLEGE OF ENGINEERING

**DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**  
**COURSE OUTCOMES (COs)**  
**Batch : 2025-2029**

**I B. Tech. I Semester**

| Course Code with Title                    | CO# | CO Statement   |
|---|-----|--|
| A9001-<br>Matrices and<br>Calculus        | 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.  |
| A9007-<br>Engineering<br>Physics          | 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 PN 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   |
| A8501-<br>Problem<br>Solving<br>Through C | 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 organizing a complex task.  |
|   | CO5 | Make use of Pointers and Files to store and retrieve data  |
| A8204- Basic<br>Electrical<br>Engineering | CO1 | Apply the network reduction techniques and Knowledge of Alternating quantities to calculate Current, Voltage and Power for complex circuits. |
|   | CO2 | Analyze the electrical Circuits using Nodal Analysis, Mesh analysis and Network theorems.  |
|   | CO3 | Study and Analyze the different types of DC Machines, Transformers.  |
|   | CO4 | Test the performance of DC Generator, DC Motor, transformer and Induction Motor.   |
|   | CO5 | Introduce components of low voltage electrical Installations.  |
| A8401- Digital<br>Logic Design            | CO1 | Apply Boolean algebra and minimization techniques to simplify a Boolean function.  |
|   | CO2 | Build combinational circuits using logic gates.  |

| Course Code with Title                        | CO# | CO Statement  |
|---|-----|---|
|   | CO3 | Analyze the behavior of latches and flip-flops for designing sequential logic.  |
|   | CO4 | Construct synchronous sequential circuits using flip-flops and combinational logic  |
|   | CO5 | Make use of Programmable Logic Devices in the design of digital systems   |
| A8007- Applied Physics Laboratory             | 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.  |
| A8502- Problem Solving Through C Laboratory   | 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   |
| A8205-Basic Electrical Engineering Laboratory | CO1 | Analyze and demonstrate the application of Ohm's Law and Kirchhoff's Laws in DC and AC circuits.  |
|   | CO2 | Demonstrate practical application and evaluation skills by analyzing and verifying Superposition, Thevenin's, and Norton's theorems in provided circuits.             |
|   | CO3 | Analyze and interpret the torque-speed and performance characteristics of DC motors to evaluate their operational efficiency.   |
|   | CO4 | Analyze the open-circuit, short-circuit, and performance test results of transformers and AC machines to assess their key parameters and operational characteristics. |
| A8301- Engineering Workshop                   | 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.  |
| A8021- Social Innovation                      | 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.   |

### I B. Tech. II Semester

| Course Code with Title                                     | CO# | CO Statement  |
|--|-----|---|
| A8002- Ordinary Differential Equations and Vector Calculus | 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 |

| Course Code with Title  | CO# | CO Statement   |
|---|-----|--|
| A8008-<br>Engineering<br>Chemistry                                      | 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.   |
| A8010- English<br>for Skill<br>Enhancement                              | 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.  |
| A8505-Data<br>Structures  | 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.   |
| A8403-<br>Electronic<br>Devices and<br>Circuits                         | CO1 | Analyze the operation and characteristics of electronic devices  |
|   | CO2 | Construct electronic circuits making use of diodes and transistors.  |
|   | CO3 | Analyze rectifier, filter and regulator circuits to obtain regulated DC output.  |
|   | CO4 | Make use of biasing and stabilization techniques to obtain the DC operating point of BJT.                                |
|   | CO5 | Analyze single stage amplifier circuits using low frequency h-parameter model  |
| A8009-<br>Engineering<br>Chemistry<br>Laboratory                        | 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.                                      |
| A8011- English<br>Language And<br>Communication<br>Skills<br>Laboratory | 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   |
| A8507- Data<br>Structures<br>Laboratory                                 | 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.   |
| A8404-  | CO1 | Analyze the operation and characteristics of electronic devices.   |

| Course Code with Title                     | CO# | CO Statement   |
|--|-----|--|
| Electronic Devices and Circuits Laboratory | CO2 | Build electronic circuits making use of diodes and transistors and verify the operations practically.  |
|  | CO3 | Analyze rectifier and filter circuits and compute its characteristics.   |
|  | CO4 | Design and verify the amplifier circuits for given specifications and plot the frequency response..  |
|  | CO5 | Analyze the electrical properties of MOS devices practically and plot the transfer and drain characteristics.  |
| A8302- Computer Aided Drawing              | 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-dimentional views of simple objects using isometric coordinates.   |
| A8022- Engineering Exploration             | 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. |

## II B. Tech. I Semester

| Course Title with Code                         | CO# | Course Outcomes  |
|--|-----|--|
| A8004- Numerical Methods and Complex Variables | CO1 | Apply appropriate Numerical method to approximate a root of an equation.   |
|  | CO2 | Identify suitable Numerical method to approximate the values of the function at given intermediate points.                           |
|  | CO3 | A Test for analyticity of complex functions in the given domain.   |
|  | CO4 | Build analytic function in series of complex terms.  |
|  | CO5 | Evaluate real and complex integrals along a contour.   |
| A8211-Network Analysis                         | CO1 | Analyze self and mutual inductance, coefficient of coupling, and dot convention, and series-parallel connections of coupled circuits |
|  | CO2 | Evaluate AC power parameters and resonance in AC circuits.   |
|  | CO3 | Apply network theorems to simplify complex electrical circuits and evaluate two-port network parameters.                             |
|  | CO4 | Analyze transient response of series RL, RC and RLC circuits.  |
|  | CO5 | Analyze and design various types of filters such as low pass, high pass, band pass and band elimination filters and attenuators.     |
| A8407-   | CO1 | Design and analyze multistage amplifiers for the given specifications using  |

| Course Title with Code                             | CO# | Course Outcomes  |
|--|-----|--|
| Electronic Circuit Analysis                        |     | small signal model   |
|  | CO2 | Apply the concepts of feedback in the design and evaluation of amplifiers and oscillators.   |
|  | CO3 | Analyze the performance of high frequency amplifiers using hybrid- $\pi$ model.  |
|  | CO4 | Analyze the performance characteristics of Class A, Class B, Class C and Class AB power amplifiers   |
|  | CO5 | Design and analyze the tuned amplifiers at radio frequencies and compare their frequency responses   |
| A8408- Signals and Systems                         | CO1 | Analyze the characteristics of Continuous-time (CT) and Discrete-time (DT) signals and systems   |
|  | CO2 | Analyze the behavior of continuous and discrete time LTI systems using Convolution and transform analysis                                    |
|  | CO3 | Evaluate the spectral characteristics of continuous time-periodic and aperiodic signals using Fourier analysis                               |
|  | CO4 | Analyze CT and DT signals using Laplace transform and Z-transform with region of convergence.  |
|  | CO5 | Apply the principles of signal analysis to the filtering and sampling process.   |
| A8409- Probability Theory and Stochastic Processes | CO1 | Demonstrate the importance of probability concepts in single and multiple random variables to find their distribution and density functions. |
|  | CO2 | Apply the concepts of operations on single and multiple random variables to Solve the communication engineering problems.                    |
|  | CO3 | Investigate the characteristics of random processes.   |
|  | CO4 | Analyze the propagation of random signals in LTI systems.  |
|  | CO5 | Apply the concepts of random processes to characterize the random noise.   |
| A8410- Electronic Circuit Analysis Laboratory      | CO1 | Design and verify the functionality of amplifiers based on specifications given.   |
|  | CO2 | Practically analyze the effect of feedback and cascading in amplifiers   |
|  | CO3 | Verify the performance of amplifier circuits using hardware components or in software tool such as Multisim.                                 |
|  | CO4 | Design amplifier and oscillator circuits for a given specifications and plot the frequency response of the amplifiers.                       |
|  | CO5 | Compare the performance of power amplifiers and tuned amplifiers practically.  |
| A8411 -Basic Simulation Laboratory                 | CO1 | Interpret the concepts of continuous time signals and systems using MATLAB.  |
|  | CO2 | Analyze the behavior of continuous time LTI systems using transform analysis and convolution.  |
|  | CO3 | Evaluate the spectral characteristics of continuous time-periodic and aperiodic signals using transformation techniques.                     |
|  | CO4 | Analyze discrete time signals using Z-Transform.   |
|  | CO5 | Apply the knowledge of signal analysis for the conversion of CT signal into DT signal using MATLAB   |
| A8412 -Digital Logic Design Laboratory             | CO1 | Build combinational circuits using gate primitives and module instantiation of Verilog HDL.  |
|  | CO2 | Construct combinational circuits using data flow modeling of Verilog HDL.  |
|  | CO3 | Develop sequential circuits using behavioural modeling of Verilog HDL.   |

| Course Title with Code                                  | CO# | Course Outcomes   |
|---|-----|---|
|   | CO4 | Implement finite state machines using Verilog HDL.  |
|   | CO5 | Design the memory circuits using Verilog HDL.   |
| A8023 - Engineering Design Thinking                     | 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                                |
| A8031 -Gender Sensitization                             | CO1 | Interpret gender sensitization and problems of other genders.   |
|   | CO2 | Identify 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.   |
| A8033 - Universal Human Values 2: Understanding Harmony | CO1 | Analyze the process of self-exploration, right understanding, relationships, and 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.           |

## II B. Tech. II Semester

| Course Title with Code                           | CO# | Course Outcomes  |
|--|-----|--|
| A8013 -Business Economics and Financial Analysis | 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.                 |
| A8415-Analog Electronic Circuits                 | CO1 | Sketch the response of various electronic circuits for given input                   |
|  | CO2 | Compare the frequency response of Active and Passive filters                         |
|  | CO3 | Analyze the characteristics of Operational Amplifier                                 |
|  | CO4 | Design Signal Processing and Generation circuits for the given specifications        |
|  | CO5 | Examine Analog to Digital and Digital to Analog converters for given resolution      |
| A8416-Computer Organization and                  | CO1 | Analyze the structure of computers to perform register transfer and micro operations |

| Course Title with Code                                     | CO# | Course Outcomes  |
|--|-----|--|
| Microprocessors  | CO2 | Design micro programmed control unit and arithmetic & logic unit to perform control and arithmetic operations                                  |
|  | CO3 | Analyze the functionality of 8086 microprocessor architecture in minimum mode configuration  |
|  | CO4 | Develop assembly language programs using 8086 instruction set for arithmetic, logical and string manipulation                                  |
|  | CO5 | Construct a fully functional 8086 computer system by interfacing memory and IO devices   |
| A8417-Analog Communications                                | CO1 | Analyze the amplitude and angle modulation schemes using the time and frequency domain to calculate performance parameters                     |
|  | CO2 | Generate and demodulate amplitude and angle modulation signals using appropriate methods and techniques  |
|  | CO3 | Analyze the operational efficacy of radio transmitters and receivers to assess communication systems' overall performance and reliability      |
|  | CO4 | Apply Power spectral density principles to evaluate the SNR of analog modulation schemes   |
|  | CO5 | Comprehend various pulse modulation and demodulation techniques to assess limitations in different practical applications                      |
| A8418- Electromagnetic Theory and Transmission Lines       | CO1 | Interpret electric and magnetic field distributions using vector algebra and vector calculus.  |
|  | CO2 | Apply the basic laws of Electromagnetics to determine field intensities  |
|  | CO3 | Apply Maxwell's equations to determine boundary conditions across various media  |
|  | CO4 | Analyze EM wave's characteristics in different media.  |
|  | CO5 | Analyze the characteristics the lossy, lossless and distortion less Transmission lines for different load conditions                           |
| A8419-Analog Electronic Circuits Laboratory                | CO1 | Examine the output response of linear and non-linear circuits to realize the applications like High pass RC circuits and Low pass RC circuits. |
|  | CO2 | Analyze the frequency response of Active and Passive filters   |
|  | CO3 | Implement and examine linear and nonlinear applications using operational amplifier  |
|  | CO4 | Design and implement signal generation circuits for the given specifications   |
|  | CO5 | Analyze and illustrate converters that convert data from Analog to Digital and Digital to Analog.  |
| A8420-Computer Organization and Microprocessors Laboratory | CO1 | Examine the signed and unsigned Data Representation through Assembly Language Instructions   |
|  | CO2 | Demonstrate the functionality of 8086 microprocessor programming model using an assembler  |
|  | CO3 | Develop an 8086 assembly language program using arithmetic, logical and branch instructions to implement a specific algorithm                  |
|  | CO4 | Apply the assembly language programming proficiency to perform string manipulations to assemble and run on host machine                        |
|  | CO5 | Integrate hardware and software modules for interfacing external devices to an 8086 microprocessor   |
| A8421- Analog  | CO1 | Estimate the modulation parameters for Amplitude and Angle modulation  |

| Course Title with Code                       | CO# | Course Outcomes   |
|--|-----|---|
| Communications Laboratory                    |     | techniques using time domain waveforms  |
|  | CO2 | Analyze the waveform characteristics and spectral properties of Suppressed carrier modulation schemes   |
|  | CO3 | Examine the utilization of time division multiplexing (TDM) in pulse modulation techniques for signal transmission and reception                    |
|  | CO4 | Design the AGC and squelch circuit for a given input signal strength in receivers   |
|  | CO5 | Evaluate the functionality of the mixer circuits and frequency synthesizer to obtain frequency translation and frequency multiplication             |
| A8527- Applied Python Programming Laboratory | CO1 | Make use of core aspects of programming and features of the Python language   |
|  | CO2 | Apply core programming concepts like data structures, conditionals, loops, variables, and functions of the Python language.                         |
|  | CO3 | Demonstrate different tools for writing and running Python code on hardware boards  |
|  | CO4 | Design a fully-functional Python programs using standard Python Syntax and Semantics.   |
|  | CO5 | Analyse the major environmental effects of exploiting natural resources   |
| A8024- Product Realization                   | 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.   |
| A8032- Environmental Science and Technology  | 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 & environmental ethics for the protection of forest and wildlife.  |
|  | CO4 | Apply to maintain harmonious relation between nature and human being and integrating sustainable development goals into their engineering practice. |
|  | CO5 | Analyze the major environmental effects of exploiting natural resources.  |

**HEAD, ECE**