VARDHAMAN
COLLEGE OF ENGINEERING

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OUTCOMES (COs)

Regulations: VCER22

I B. Tech. I Semester

Course Code with Title	CO #	CO Statement
A8001- Matrices and Calculus	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.
A8006- Applied Physics	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.
A8501- Problem Solving 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 Electrical Engineering	CO1	Apply DC circuit principles, network reduction techniques, and theorems to solve Complex DC circuits
	CO2	Analyze single-phase AC circuits using sinusoidal waveforms, average and RMS values, and j-notation.
	CO3	Analyze 1-phae transformer principles, construction, EMF equation, and no load and on-load conditions.
	CO4	Analyze the operation and characteristics of DC generators and motors, including EMF and torque equations
	CO5	Evaluate the construction, operation, and torque characteristics of three-phase induction motors and synchronous generators.
A8401- Digital Logic Design	CO1	Apply Boolean algebra and minimization techniques to simplify a Boolean function.
	CO2	Build combinational circuits using logic gates.
	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.

Course Code with Title	CO #	CO Statement
	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
A8008-Engineering 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	CO1	Build competence in grammar for effective communication.

Course Code with Title	CO#	CO Statement
for Skill Enhancement	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 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-Electronic Devices and 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-Engineering Chemistry 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 Language And Communication Skills 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 Structures 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-Electronic Devices and Circuits Laboratory	CO1	Analyze the operation and characteristics of electronic devices.
	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.

Course Code with Title	CO#	CO Statement
	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-Electronic Circuit Analysis	CO1	Design and analyze multistage amplifiers for the given specifications using 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-π 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

Course Title with Code	CO#	Course Outcomes
		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.
	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

Course Title with Code	CO#	Course Outcomes
		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	Examine Analog to Digital and Digital to Analog converters for given resolution
	CO5	Design Signal Processing and Generation circuits for the given specifications.
A8416-Computer Organization and Microprocessors	CO1	Analyze the structure of computers to perform register transfer and micro operations
	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

Course Title with Code	CO#	Course Outcomes
	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 Communications Laboratory	CO1	Estimate the modulation parameters for Amplitude and Angle modulation 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- 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.

Course Title with Code	CO#	Course Outcomes
	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.

III B. Tech. I Semester

Course Title with Code	CO#	Course Outcomes
A8422- Digital Communications	CO1	Estimate the Signal to Noise ratio of baseband modulation schemes to measure the performance of digital communication system.
	CO2	Compare digital carrier modulation schemes in terms of bandwidth and probability of error to realize real time digital communication system.
	CO3	Apply information theory principles to measure channel capacity parameters.
	CO4	Apply linear block codes to improve the reliability of a communication system.
	CO5	Make use of convolutional codes to enhance the performance of a communication system.
A8423- Antennas and Wave Propagation	CO1	Analyze the parameters influencing antenna performance and evaluate the radiation mechanism in designing and optimizing antenna systems.
	CO2	Compute the radiation fields and draw the patterns of an antenna array to assess the suitability for a given application.
	CO3	Demonstrate proficiency in the design of Wire antennas optimized for VHF/UHF applications.

Course Title with Code	CO#	Course Outcomes
	CO4	Design and optimize Aperture antennas tailored to specific Microwave applications.
	CO5	Choose an appropriate wave propagation mode for establishing communication link between two points.
A8424-Control Systems	CO1	Analyze and simplify open-loop and closed-loop transfer functions using block diagram reduction methods, signal flow graphs, and Mason's gain formula.
	CO2	Apply the principles of time response analysis in control systems to evaluate systems with first and second-order dynamics..
	CO3	Analyze control system stability using Routh's criterion and evaluate the effects of adding poles and zeros to G(s)H(s) through root locus analysis
	CO4	Analyze frequency domain specifications using Bode diagrams, and asess system stability through phase margin, gain margin, Polar plots, and Nyquist plots.
	CO5	Apply compensation techniques and PID controllers to improve control system performance, and interpret state space representations.
A8425-Microcontrollers	CO1	Analyze features of Intel 8051 microcontroller and ARM cortex processor to use it for desired applications.
	CO2	Develop embedded C programs of 8051 microcontroller and ARM cortex processor.
	CO3	Interface peripheral devices to Intel 8051 microcontroller and ARM cortex processor to realize practical applications.
	CO4	Interface memory and IO devices to Intel 8051 microcontroller and ARM cortex processor to make it a functional model.
	CO5	Analyze interrupt structure of Intel 8051 microcontroller and ARM cortex processor for the execution of interrupt request.
A8426- Digital Communications Laboratory	CO1	Analyze the performance of analog to digital conversion schemes.
	CO2	Implement band pass modulation schemes for a given input data.
	CO3	Analyze the generation and detection of digital modulation schemes using different sources.
	CO4	Develop digital modulation methods to verify the functionality of band pass data transmission.
	CO5	Implement error control codes to enhance the reliability of a communication system.
A8427-Microcontrollers laboratory	CO1	Develop embedded C programs for 8051 microcontroller and ARM cortex processor.
	CO2	Utilize the Keil C compiler, Nano Edge AI studio and Cube IDE for programming microcontrollers.
	CO3	Interface peripheral devices to Intel 8051 microcontroller and ARM cortex processor to realize practical applications.
	CO4	Interface memory and IO devices to Intel 8051 microcontroller and ARM cortex processor to make it a functional model.
	CO5	Demonstrate interrupt execution of Intel 8051 microcontroller.
A8034- Indian Constitution	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

Course Title with Code	CO#	Course Outcomes
	CO4	Identify the basic structure of Indian Constitution
	CO5	Relate the basic concepts of democracy, liberty, equality, secular and justice
A8451 -System Verilog for Verification	CO1	Identify the concepts of verification methodologies and data types.
	CO2	Apply the concepts of procedural statements, routines and assertions to construct digital circuits
	CO3	Analyze the concepts of functional coverage for given specifications
	CO4	Make use of the concepts of OOP terminology in system verilog HDL.
	CO5	Examine the design functionality by applying randomization in system Verilog HDL
A8452-Real Time Operating Systems	CO1	Compare Real Time Operating System and other Operating System and also identify the Real Time Design Issues
	CO2	Build the applications to run in parallel either using Process or Threads.
	CO3	Analyze a Practical Real Time System and its optimal core elements.
	CO4	Identify the Scheduling Schemes for real time systems and Protocols for the Broadcast Networks
	CO5	Analyze the Performance of different Real Time Systems.
A8453- Digital Image Processing	CO1	Interpret the fundamentals of digital image formation, representation and various operations on digital images
	CO2	Apply the concepts of enhancement techniques in spatial domain to enhance the quality of an image
	CO3	Analyze images in the frequency domain using various transforms
	CO4	Apply suitable morphological and segmentation algorithms to extract features of interest in an image
	CO5	Outline the various feature extraction techniques for image analysis and recognition
A8454- Computer Communication Networks	CO1	Categories and functions of various Data communication Networks.
	CO2	Design and analyze various error detection techniques for developing better communication networks.
	CO3	Demonstrate the mechanism of routing the data in network layer.
	CO4	Analyze the significance of various Flow control and Congestion Control Mechanisms to reduce errors.
	CO5	Apply the function of various Application Layer Protocols to provide better services.

III B. Tech. II Semester

Course Title with Code	CO#	Course Outcomes
A8428- CMOS VLSI Design	CO1	Analyze the electrical properties and characteristics of MOS devices and circuits.
	CO2	Analyze the switching characteristics of CMOS inverter.
	CO3	Construct logic circuits using CMOS static logic.
	CO4	Construct logic circuits using transmission gate-based logic.
	CO5	Analyze logic circuits using dynamic and differential logic design styles.

Course Title with Code	CO#	Course Outcomes
A8429- Digital Signal Processing	CO1	Apply the fundamentals of signals and systems to obtain the response of DT systems
	CO2	Analyze Discrete time signals and systems using transform techniques
	CO3	Design and implement digital FIR filters for given specifications
	CO4	Design and implement digital IIR filters for given specifications
	CO5	Design DSP computational building blocks to achieve high speed in DSP processors
A8430- Microwave Engineering	CO1	Apply the knowledge of Electromagnetics and Basic Engineering Mathematics on Microwave components and sources.
	CO2	Apply the waveguide mode characteristics to measure the performance of microwave transmission lines and waveguide components.
	CO3	Analyze various microwave transmission lines, components, sources and validate their performance
	CO4	Design the end-to-end Microwave/ RF communication links.
	CO5	Evaluate the performance of microwave sources and components.
A8431- CMOS VLSI Design Laboratory	CO1	Analyze the DC and transient characteristics of Inverter
	CO2	Construct basic logic gates using CMOS logic
	CO3	Design combinational circuit and sequential circuit using CMOS logic
	CO4	Design combinational circuit and sequential circuit using transmission gates
	CO5	Construct logic circuits using dynamic and differential logic styles
A8432- Digital Signal Processing Laboratory	CO1	Interpret the concepts of Discrete time signals and systems using MATLAB
	CO2	Analyze Discrete time signals and systems using transform techniques using MATLAB.
	CO3	Implement digital FIR and IIR filters for the given specifications using MATLAB.
	CO4	Demonstrate the concepts of discrete time signals and systems using DSP Processors.
	CO5	Design digital filters for the given specifications using DSP processors.
A8012- Advanced English Communication Skills Laboratory	CO1	Improve comprehensive skills in listening and reading
	CO2	Develop effective technical writing skills and e- correspondence
	CO3	Build communication skills in different socio-cultural and professional contexts
	CO4	Organize the dynamics of group discussion for effective participation
	CO5	Analyze strategies to succeed in interviews.
A8035- Research Methodology	CO1	Identify an appropriate research problem in their suitable domain
	CO2	Apply suitable sampling techniques, data collection methods, and analytical tools to conduct systematic research investigations.
	CO3	Analyze the complex issues inherent in selecting a research problem, research design, and implementing a research project
	CO4	Construct and present a well-structured research paper and deliver scientific presentations using appropriate tools, formats, and communication techniques
	CO5	Express the importance of research ethics in the scientific community
A8455- FPGA Design	CO1	Apply the concept of programming logic devices to model various applications.
	CO2	Examine the organization of FPGAs.
	CO3	Distinguish various SRAM based FPGA architectures.

Course Title with Code	CO#	Course Outcomes
	CO4	Compare various Antifuse FPGA based architectures.
	CO5	Make use of the knowledge of FPGAs in designing and implementing digital ICs.
A8456- Advanced Core Architecture	CO1	Apply pipelining and vector processing techniques to improve performance of computers
	CO2	Make use of registers, complementors, parallel adders, and sequence counters to design an Arithmetic and Logic Unit (ALU) for computers
	CO3	Examine the features of shared memory and distributed memory computer architectures for multiprocessor and multicomputer systems
	CO4	Classify the parallel computer models based on system attributes and performance.
	CO5	Analyze the multithreaded and superscalar models in advanced core architecture computers
A8457- Machine Learning for Visual Analysis	CO1	Interpret the image formation process for reconstruction
	CO2	Apply pre-processing techniques on digital images for better classification
	CO3	Apply feature descriptor techniques on images to extract application dependent features
	CO4	Analyze the machine learning models to solve real-time pattern classification problems
	CO5	Analyze the impact of machine learning models in face and gesture recognition
A8458- Wireless Communications and Networks	CO1	Apply the knowledge of various systems, techniques and technologies for effective wireless communication.
	CO2	Analyze the different types of protocols, multiple access techniques and standards for the development of wireless networking.
	CO3	Evaluate the importance of mobile radio Propagation, fading and path loss models
	CO4	Examine wireless communication systems of 4G and 5G technologies
	CO5	Apply the concept of network architecture, protocols, and capabilities for the development of various wireless networks.
A8459- CMOS Analog IC Design	CO1	Analyze the large signal and small signal models of MOS transistor.
	CO2	Analyze the different types of current mirror and amplifier circuits
	CO3	Analyze the different types of high gain amplifier architectures.
	CO4	Analyze the various compensation techniques applied to op-amp.
	CO5	Analyze the characteristics of comparator circuits.
A8460- Embedded System Design	CO1	Utilize the classification of embedded systems based on performance, complexity, and era to assess their suitability for modern applications.
	CO2	Examine the factors influencing the selection of memory, sensors, actuators, and their interfacing to design optimized embedded systems.
	CO3	Implement various approaches to embedded firmware development, integrating hardware and software considerations effectively.
	CO4	Analyze the role of real-time operating systems (RTOS) in embedded firmware design, focusing on task scheduling, multitasking, and multiprocessing.
	CO5	Apply task synchronization techniques to evaluate address latency and performance challenges in embedded systems.
A8461- Machine Learning for Signal	CO1	Interpret the fundamentals of Machine Learning and apply classification techniques to real-world problems.

Course Title with Code	CO#	Course Outcomes
Processing	CO2	Analyze and apply mathematical concepts to various machine learning models, including regression and classification.
	CO3	Distinguish between different types of machines learning algorithms and their applications.
	CO4	Develop machine learning models for real-time applications, including clustering and regression techniques.
	CO5	Implement and refine machine learning algorithms for applications in image processing, face recognition, and gesture recognition.
A8462- Satellite and Radar Communications	CO1	Analyze the location of the satellite using orbital mechanics and launching procedures
	CO2	Categorize various multiple access techniques and evaluate link budgets for different frequency bands
	CO3	Apply the radar range equation to predict and evaluate the detection performance of radar systems under varying environmental and system constraints.
	CO4	Analyze the features of radar receiver's components and their usage in aerospace guidance
	CO5	Demonstrate the fixed and moving targets using different types of tracking radars.

IV B. Tech. I Semester

Course Title with Code	CO#	Course Outcomes
A8435-IoT Architectures and Protocols	CO1	Analyze the challenges and impacts of IoT networks that lead to the development of new architectural models
	CO2	Understand the concepts of IoT Architecture Reference model used in real world Applications.
	CO3	Identify appropriate communication protocols suitable for different IoT systems.
	CO4	Apply IP-based protocols and authentication mechanisms to ensure secure communication in IoT.
	CO5	Design IoT-based systems to solve real-world problems.
A8436 -Mobile Communications and Networks	CO1	Inspect the cell splitting and sectorization techniques to increase the system capacity.
	CO2	Analyze the frequency reuse pattern techniques for reducing the interference in a cellular communication system.
	CO3	Analyze mobile radio propagation models and antennas for cell site and mobile unit.
	CO4	Distinguish the channel assignment strategies and handoffs to achieve efficient spectrum utilization.
	CO5	Analyze the architectures of modern cellular communication systems and their components to understand system operation and integration.
A8437-IoT Architectures and Protocols Laboratory	CO1	Interface sensors with NodeMCU ESP 8266 and Raspberry pi to enable communication with cloud platforms.
	CO2	Utilize the modern tools for programming processor and controller.
	CO3	Analyze the analog and digital sensors to interface with IoT devices
	CO4	Demonstrate the concept of communication protocols through sensor interfacing.

Course Title with Code	CO#	Course Outcomes
	CO5	Design IoT Applications using ARIES boards to address real-time challenges.
A8438-Advanced Communications Laboratory	CO1	Inspect the Transmitted and Received signals to increase the system capacity.
	CO2	Analyze the frequency reuse pattern techniques, sectoring and handoff mechanism for reducing the interference in a cellular communication system.
	CO3	Analyze mobile various propagation path loss models and antennas for cell site and mobile unit.
	CO4	Analyze DSSS technique for CDMA and observe effect of variation of types of PN codes to achieve efficient spectrum utilization.
	CO5	Calculate performance parameters of various types of antennas .
A8463-VLSI Physical Design Automation	CO1	Analyze the concepts of Physical Design Process such as partitioning, Floor planning, Placement and Routing, simulation and synthesis.
	CO2	Analyze physical design problems and employ appropriate automation algorithms for partitioning, floor planning, placement and routing.
	CO3	Analyze the different types of simulation mechanisms
	CO4	Solve the performance issues in circuit layout.
	CO5	Apply the optimization techniques for different tasks involved in high level synthesis
A8464-Sensors and Actuators	CO1	Identify basics of sensors, actuators and their operating principles.
	CO2	Make use of micro-processing techniques for designing and developing sensors and actuators.
	CO3	Examine the importance of interfacing sensors and signal conditioning circuits to establish any control system or monitoring system
	CO4	Analyze the simulation and its characterization of different sensors
	CO5	Apply the characteristic parameters to evaluate sensor performance.
A8465-Artificial Neural Networks	CO1	Make use of the basic model of artificial neuron and compare the functions of both artificial neuron and biological Neuron.
	CO2	Develop different architectures of Artificial Neural Networks and apply learning laws and the learning rules associated with the neural networks
	CO3	Analyze single layer feed forward neural networks.
	CO4	Analyze various parameters in the design process of multi layer perceptron to optimize the performance.
	CO5	Analyze the problem of linearly separable using Perceptron model and relate to the concept of Madaline networks.
A8466-Optical Communications	CO1	Analyze the constructional parameters of optical fibers for improving the efficiency.
	CO2	Apply the principles of signal distortion in the design and development of efficient optical fiber systems
	CO3	Analyze the characteristics of fiber optics to design optical detectors
	CO4	Design a fiber optic communication system using power and link budget calculations to ensure optimal system performance.
	CO5	Apply appropriate splicing techniques and fiber modes in practical optical communication setups to minimize signal loss and distortion.
A8467-Low Power VLSI Design	CO1	Analyze the sources of power dissipation in MOSFET
	CO2	Examine the power estimation techniques using various approaches in low power circuit design.

Course Title with Code	CO#	Course Outcomes
	CO3	Analyze the power optimization and trade-off techniques in digital circuits
	CO4	Develop low voltage CMOS circuits using low power design techniques.
	CO5	Apply the advanced techniques to design low power VLSI circuits
A8468-System on Chip Architecture	CO1	Expected to understand SOC Architectural features
	CO2	To acquire the knowledge on processor selection criteria and limitations
	CO3	To acquires the knowledge of memory architectures on SOC
	CO4	To understands the interconnection strategies and their customization on SOC.
	CO5	Design the required hardware & software modules and integrate to be a functional model.
A8469- Biomedical Signal Processing	CO1	Knowledgeable of the basic signal processing techniques in analyzing biological signals
	CO2	To possess the basic mathematical & computational skills necessary to analyse biomedical signals
	CO3	Formulate and solve basic problems in biomedical signal analysis is enhanced
	CO4	Aware of the complexity of biological signal and the impact, promise of biomedical engineering in understanding these signals.
	CO5	Demonstrate to effectively communicate their ideas in terms of biomedical signal parameters.
A8470- Wireless Sensor Networks	CO1	Analyze radio standards and communication protocols for wireless sensor networks.
	CO2	Apply the node functions to design sensor network
	CO3	Demonstrate knowledge of Physical and MAC protocols developed for WSN
	CO4	Analyze and compare various data gathering and data dissemination methods.
	CO5	Analyze security challenges of wireless sensor networks

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Course Title with Code	CO#	Course Outcomes
A8471- High Speed VLSI Design	CO1	Explore the circuits and techniques involved in high speed VLSI design
	CO2	Make use of various logic styles to design high speed VLSI circuits
	CO3	Analyze design-driven performance variability, storage element designs and related issues
	CO4	Apply various chip interface techniques for high speed circuits
	CO5	Apply clocking styles for high speed VLSI circuits
A8472- IoT Security and Gateway	CO1	Determine the most appropriate IoT Devices and Sensors based on Application
	CO2	Analyze the concepts of IoT Network Architecture and design
	CO3	Design and implement cryptography algorithms
	CO4	Analyze network security problems in various networks
	CO5	Build security systems using elementary blocks and cloud based IoT systems

Course Title with Code	CO#	Course Outcomes
A8473- Electronic Measurements and Instrumentation	CO1	Demonstrate the acquired knowledge of Ammeter, Voltmeter, Multimeter and performance characteristics of electrical & non- electrical instruments to design various measuring devices.
	CO2	Apply different methods of transducers to measure various non-electrical parameters.
	CO3	Inspect the functional operation of oscilloscopes, signal analyzers for the measurement of various signals and lissajous patterns.
	CO4	Analyze the various AC and DC bridge circuits to find unknown values of R, L, C to minimize errors in measurements.
	CO5	Apply Data Acquisition Systems for Instrumentation in industrial applications
A8474- 5G and Beyond Communications	CO1	Apply Spectrum utilization methods in higher bandwidth wireless communications to increase the efficiency of communication system
	CO2	Analyze Device to device communication and millimeter wave communication standards for industry applications
	CO3	Analyze the multiple access techniques and standards for the development of wireless networking and reducing interferences
	CO4	Apply radio propagation technologies to provide enhanced performance in massive 5G communications
	CO5	Apply future Mobile Technologies and protocols in massive MIMO systems for better performance in 5G systems.
Open Electives		
A8181- Smart Cities	CO1	Interpret the concepts, history and evolution of smart cities.
	CO2	Identify the elements of smart city such as smart people, smart living, smart economy, smart infrastructure, smart governance and smart environment.
	CO3	Analyze the concepts, discourses and practices of smart cities across globe.
	CO4	Develop the road map for planning smart cities and benchmarking their performance for Indian context.
	CO5	Apply relevance for smart cities of developing economies considering issues as inclusiveness, feasibility and sustainability.
A8182- Disaster Management	CO1	Identify basic concepts of hazards, vulnerabilities and risks of disaster phenomena.
	CO2	Interpret various types of disasters and disaster coping strategies.
	CO3	Examine Disaster Impacts and suggest suitable capacity building frame work for disaster management.
	CO4	Select appropriate steps in Disaster management cycle for Disaster Risk Reduction.
	CO5	Develop Strategies for disaster management planning and sustainable development.
A8183- Environmental Pollution Management	CO1	Identify water pollution sources, types and treatment methods.
	CO2	Apply knowledge on Prevention and control of air pollution.
	CO3	Inspect sources, effects and mitigation methods of noise pollution.
	CO4	Examine soil pollution sources, effects and control measures.
	CO5	Develop Environmental management plan to minimize environmental pollution.
A8155- Green Building and	CO1	Identify green building and green building materials.
	CO2	Make use of different rating agencies to classify the type of building.

Course Title with Code	CO#	Course Outcomes
Sustainability	CO3	Analyze sustainability and its implications for the practice of engineering.
	CO4	Evaluate the potential of the alternative construction materials for sustain ability.
	CO5	Examine the green building rating systems and its contribution to sustain ability.
A8224- Electric Vehicles	CO1	Infer the electric vehicle system and its impact on environment.
	CO2	Analyze the various hybrid vehicle configurations and its performance.
	CO3	Interpret the electric drives used in hybrid and electric vehicles.
	CO4	Choose proper energy storage systems for electric vehicle applications.
	CO5	Identify the different charging systems and charging infrastructure for EVs.
A8281-Solar Energy and Applications	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.
A8282-Energy Storage Systems	CO1	Apply the knowledge of concepts of science to understand the concepts of electro chemical cell.
	CO2	Apply the knowledge of electro chemistry to describe the components and process in batteries.
	CO3	Describe the electrical, thermal, and mechanical behavior of Li-Ion batteries under various operating conditions.
	CO4	Apply the knowledge of basic science concepts to distinguish various types of fuel cells and their functionalities
	CO5	Apply the knowledge of science to interpret the operation and characteristics of super capacitors.
A8283- Power Generation Systems	CO1	List the different components of an electric power system.
	CO2	Categorize the conventional methods of generating electrical power to meet the required load demand.
	CO3	Categorize the Non-conventional methods of generating electrical power to meet the required load demand.
	CO4	Model a power system to reduce economic losses.
A8381-Hybrid Vehicles	CO1	Identify different types of hybrid vehicles and their power train configurations
	CO2	Analyze the energy management strategy for hybrid vehicles
	CO3	Develop and optimize the hybrid vehicles subsystems
	CO4	Apply advanced technologies and materials in hybrid vehicles design
	CO5	Evaluate the performance and environmental impact of hybrid vehicle.
A8382-Fundamentals of Robotics	CO1	Illustrate the basic concepts and components of a robotic system
	CO2	Select appropriate actuators and sensors for designing robot mobility system
	CO3	Solve transformation problems to describe the robot position and orientation of robot

Course Title with Code	CO#	Course Outcomes
	CO4	Apply the concepts of robot work cell design and control
	CO5	Choose appropriate robots for various applications suitable to modern manufacturing systems.
A8383-3D Printing	CO1	llustrate the fundamental concepts of Additive Manufacturing and 3-D print ing, its advantages and limitations
	CO2	Apply engineering knowledge, techniques, skills and modern tools to analyze problems in 3D Printing
	CO3	Appraise additive manufacturing through 3d printing
	CO4	Solve Complex manufacturing problems for significant technological and soci etal development.
	CO5	Evaluate engineering products using the knowledge of mathematics, science, engineering and IT tools.
A8402- Digital Electronics	CO1	Apply fundamental theorems and properties of Boolean algebra to simplify a Boolean function.
	CO2	Apply the map method to obtain simplified and optimized logical expressions.
	CO3	Build combinational circuits using logic gates for real time digital systems.
	CO4	Analyze the behaviour of latches and flip-flops for designing sequential logic.
	CO5	Make use of programmable logic devices in the design of digital systems.
A8481-Basic Electronics	CO1	Analyze the operation and characteristics of electronic devices.
	CO2	Construct electronic circuits making use of diodes and transistors.
	CO3	Analyze single stage amplifiers using small signal low frequency transistor model.
	CO4	Analyze the effect of negative and positive feedback on amplifiers.
	CO5	Design single stage amplifier for given specifications.
A8482- Principles of Communication Engineering	CO1	Summarize the fundamental concepts and acquire competencies for each topic of analog and digital modulation techniques.
	CO2	Illustrate elements of analog, digital and data communications systems and identify their real-time applications.
	CO3	Compare analog and digital communication systems with respect to performance parameters and applications.
	CO4	Analyze the error control and coding techniques including Source Coding Technique, Huffman Source Coding, Error Control, and Coding.
	CO5	Distinguish the features of advanced communication systems.
A8483-Fundamentals of IoT	CO1	Identify the basic building blocks and its characteristics.
	CO2	Determine the most appropriate IoT Devices and Sensors based on Appli cation.
	CO3	Make use of Python standard libraries for implementing various IoT Appli cations.
	CO4	Analyze the appropriate protocol for establishing communication between various IoT Devices.
	CO5	Interpret cloud infrastructure, services, APIs and architectures of commer cial and industrial cloud platforms.
A8484-Introduction to	CO1	Apply the criteria of performance, complexity, and era to classify embedded systems

Course Title with Code	CO#	Course Outcomes
Embedded Systems	CO2	Analyze the factors involved in selecting memory, sensors, actuators, and their interfacing based on system requirements.
	CO3	Apply the fundamentals of microcontroller to investigate existing designs.
	CO4	Demonstrate assembly language programming to assemble and drive circuitry to the microcontroller I/O ports to interface external devices
	CO5	Evaluate the functional requirements and design a product using optimal hardware and software components
A8510-Operating Systems	CO1	Identify the services provided by the operating system for user and system.
	CO2	Examine the concepts of IPC and Synchronization for process cooperation
	CO3	Make use of Memory Management techniques for efficient use of main memory.
	CO4	Select File and Disk Management methods for effective storage and access.
	CO5	Identify a Deadlock Handling Method in allocating resources among processes.
A8514-Database Management Systems	CO1	Design a database for a given problem using E-R diagrams and Relational Model.
	CO2	Construct Queries in Relational algebra and SQL for a case study
	CO3	Use Normalization techniques to reduce data redundancy in data base.
	CO4	Select transaction control and recovery methods to keep data base consistent.
	CO5	Compare various indexing techniques and NoSQL databases for efficient access.
A8520-Software Engineering	CO1	Identify the design issues and process models to develop a software
	CO2	Determine the functional and nonfunctional requirements with appropriate validation for a software product.
	CO3	Develop software design documents for the given requirements.
	CO4	Prepare test documents at various stages to validate project.
	CO5	Illustrate the need of quality management and metrics for product standardization
A8607-Information Security	CO1	Recognize various security threats, services, mechanisms, and classical encryption techniques.
	CO2	Apply classical encryption algorithms (Substitution and Transposition ciphers) and DES, AES algorithms to encrypt plain text.
	CO3	Explain various key management techniques, exemplifying RSA and Diffie Hellman.
	CO4	Examine the problems of authentication techniques (SHA, Digital signature).
	CO5	Analyze different symmetric key distribution and understanding of various authentication applications
A8608-Java Programming	CO1	Make use of various constructs to write a console application.
	CO2	Use principles of OOP to develop real time applications.
	CO3	Identify the need of exception handling to deal with runtime errors.
	CO4	Build applications for parallel processing using Multithreading.
	CO5	Choose Collection framework and I/O to manipulate and store data.
A8651-Ethical Hacking	CO1	Use the various security tools to assess the computing system.
	CO2	Identify the vulnerabilities across any computing system using penetration testing.
	CO3	Choose a prediction mechanism to prevent any kind of attacks.

Course Title with Code	CO#	Course Outcomes
	CO4	Make use of metasploit tool to probe systematic vulnerabilities on networks and servers.
	CO5	Identify the wireless network flaws and fill security patches in web access.
A8652-Cyber Security	CO1	Identify the cybercrimes and offences in network accesses.
	CO2	Interpret the criminal plans before going to attack.
	CO3	Choose various security measures on mobile devices for a given scenario and make an effective report.
	CO4	Identify the various methods and tools in Cyber Crime.
	CO5	Examine various defense and analysis techniques to protect our information from attackers
A8656-Block chain Technology	CO1	Identify the basic concepts of block chain to process data
	CO2	Make use of Bitcoin as cryptocurrency
	CO3	Choose Ethereum block chain for security
	CO4	Design smart contracts as per the requirements and deploy on Testnet works.
A8658-Robotic Process Automation	CO1	Discuss use of RPA platform and its components.
	CO2	Apply sequence and control flows as per the requirements.
	CO3	Analyze data manipulation concepts to solve real time problems.
	CO4	Illustrate user interface explorer and handle events.
	CO5	Demonstrate scenario of handling the errors and exceptions and benefits of RPA.
A8681- E-Commerce	CO1	Elaborate the components and roles of the E-Commerce environment.
	CO2	Estimate how to sell products and services on the web as well as to meet the needs of website visitors.
	CO3	Analyze the impact of E-commerce on business models and strategy.
	CO4	Create a portfolio of the steps required to start-up an on-line business.
	CO5	Interpret legal and ethical issues related to E-Commerce and web marketing approaches.
A8682-Full Stack Development	CO1	Demonstrate the fundamentals of scripting languages & non- scripting languages and its differences.
	CO2	Use react concepts to design forms.
	CO3	Use different node.js modules to connect with database.
	CO4	Build web application using Node.js.
A8702-Artificial Intelligence	CO1	Apply AI techniques to solve game playing theorem proving and machine learning.
	CO2	Apply the propositional logic to AI designs
	CO3	Learn different playing and reinforcement learning techniques .
	CO4	Examine the role of searching strategies in AI environment.
	CO5	Analyze the constraint satisfaction problems for problem solving.
A8781-Computer Organization and Architecture	CO1	Identify various functional aspects of computer hardware.
	CO2	Choose various instructions and addressing modes to execute an instruction.
	CO3	Make use of integer and floating point algorithms to perform arithmetic operations on data.
	CO4	Design control unit and memory for a computer system.
	CO5	Examine the performance of a system using pipelining and multiprocessors.
A8851-Data	CO1	Identify the various requirements for data science process.

Course Title with Code	CO#	Course Outcomes
Science for Engineers	CO2	Choose an appropriate database required for processing data.
	CO3	Demonstrate the data science methodology and text mining approaches.
	CO4	Demonstrate the data science methodology and text mining approaches.
	CO5	Apply various data visualization techniques using Tableau over Google Sheets.
A8081-Mathematical Programming	CO1	Identify LPP and express in mathematical form to solve by graphical or simplex method.
	CO2	Apply artificial variable techniques to obtain the optimal solution of an LPP.
	CO3	Interpret various methods under transportation model to get optimal results.
	CO4	Solve travelling salesmen problem using Hungarian method.
	CO5	Develop various replacement and sequencing models to arrive at an optimal decision.
A8082-Transform Calculus	CO1	Formulate series solutions of ordinary differential equations.
	CO2	Develop Fourier series for different types of functions.
	CO3	Apply Fourier Transform to connect the time and frequency domain
	CO4	Analyze Z-transform and discrete signals to solve equations
	CO5	Apply Laplace transforms to solve integral equations.
A8083- Numerical Techniques	CO1	Apply numerical methods to obtain approximate solutions of algebraic and transcendental equations
	CO2	Make use of interpolation techniques to find approximate values and derivatives of the function at intermediate points
	CO3	Compute an approximate value of a definite integral using numerical integration
	CO4	Construct curve of best fit for the experimental data using method of least squares
	CO5	Select an appropriate numerical method to solve ordinary and partial differential equations.
A8084-Entrepreneurship Development	CO1	Identify the role, characteristics, qualities and functions of entrepreneur.
	CO2	Interpret various Institutional supports for setting up a business enterprise.
	CO3	A 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.
A8085-Logistics and Supply Chain Management	CO1	Understand the cyclical perspective of logistics and supply chain process.
	CO2	Learn about the distribution, transportation, warehousing related issues and challenges in supply chain.
	CO3	Appreciate the significance of network design in the supply chain.
	CO4	Gain knowledge of various models/tools of measuring the Supply Chain Performance.
	CO5	Appreciate the role of coordination and technology in supply chain management.
A8086-Management Science	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.

Course Title with Code	CO#	Course Outcomes
	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.
A8087- Human Resource Management	CO1	Identify the functions of Human Resource Management.
	CO2	Illustrate the process of Recruitment and selection.
	CO3	Analyze the needs and methods of training.
	CO4	Appraise the functional relationship with performance compensation and employee welfare.
	CO5	Examine the significance of employee relations.
A8088- Organizational Behavior	CO1	Analyze the Concepts and models of Organizational Behaviour and Contemporary challenges.
	CO2	Analyze the relevance of planning and decision making process for the development of the organization.
	CO3	Identify various organization design and control technique for better performance of the company.
	CO4	Examine the relevance of Individual and group behaviour in an organization and the role of Culture and dynamics
	CO5	Apply the theories of leadership and motivation to lead people to attain the Organization goals.
A8089-Intellectual Property Rights Intellectual Property Rights	CO1	Identify the different types of intellectual property, agencies and treaties that protect intellectual property rights
	CO2	Classify the protectable matter of intellectual property rights.
	CO3	Analyze and evaluate the procedures involved in submission of application for the grant of intellectual property rights
	CO4	Interpret Trade secret law, liability for misappropriations of trade secrets, protection for submission, and trade secret litigation
A8090- Professional Practice, Law and Ethics	CO1	Apply the concepts of professional practice, Law and Ethics in their personal lives and professional careers.
	CO2	Analyze Arbitration, Conciliation and Alternative Dispute Resolution system
	CO3	Interpret Law relating to Intellectual property
	CO4	Apply the rights and responsibilities as an employee, team member in any organization as a global citizen.
A8091-National Cadet Corps(NCC)	CO1	Acquire knowledge of the history of NCC, its organization, and incentives of NCC for their career prospects and duties & conduct of NCC cadets.
	CO2	Imbibe good leadership traits and apply them in practical life and appreciate the visible outcome of leadership and motivation.
	CO3	Develop a sense of responsibility, smartness in appearance and improve self-confidence, inculcate importance of empathizing with others, improve their deep-thinking ability and apply ideas and be able to face problems in a constructive manner with solutions.
	CO4	Learn about the various natural resources, their utilization and practice method of conservation of these resources in daily life.
	CO5	Appreciate value of physical and mental health in daily life and spread awareness about treatment and care of wounds in their society.

HEAD, ECE