

G PULLAIAH COLLEGE OF ENGINEERING & TECHNOLOGY (Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade |
Accredited by NBA (CIV, CSE, ECE & EEE) | Affiliated to JNTUA)
Nandikotkur Road, Venkayapalli (V), Kurnool - 518452, Andhra Pradesh

COURSE OUTCOMES-R19 REGULATION

III

S.NO	Course Outcomes (COs)
1.	A2015 Transform Techniques and Complex Variables
	A2015.1 Apply Laplace transforms to solve ordinary differential equations.
	A2015.2 Build Fourier series and Fourier transforms of a given function.
	A2015.3 Test for analyticity of complex functions in the given domain.
	A2015.4 Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours.
	A2015.5 Evaluate improper integrals of complex functions using Residue theorem.
2.	A2401 Electronic Devices and Circuits
	A2401.1 Explain the construction, working principles and applications of various electronic devices.
	A2401.2 Analyze the characteristics of diodes and transistors.
	A2401.3 Design the DC bias circuitry of BJT and FET for various applications.
	A2401.4 Construct the simple amplifier circuits using BJT and FET.
3.	A2402 Digital Logic Design
	A2402.1 Apply arithmetic operations and principles of Boolean algebra to minimize logic expressions.
	A2402.2 Make use of K-map and tabulation methods to minimize Boolean functions.
	A2402.3 Analyze the performance of different combinational and sequential circuits.
	A2402.4 Design various programmable logic devices using combinational circuits.
4.	A2403 Signals and Systems
	A2403.1 Distinguish between different signals and systems.
	A2403.2 Make use of Fourier series for the representation of signals.
	A2403.3 Analyze different signals by using an appropriate transform.
	A2403.4 Examine the transmission characteristics of linear systems.
	A2403.5 Select an appropriate transform to find the transfer function of linear systems.
5.	A2404 Probability Theory and Stochastic Processes
	A2404.1 Apply different probability techniques to observe the different events.
	A2404.2 Determine the characteristics of random variables and random processes.
	A2404.3 Classify the random processes by using different techniques.
	A2404.4 Analyze the temporal and spectral characteristics of stochastic processes.
	A2404.5 Develop the relationship between the input and output statistical characteristic of a linear system.
6.	A2405 Electronic Devices and Circuits Laboratory
	A2405.1 Identify various electronic components and measuring equipment.
	A2405.2 Analyze the V-I characteristics of electronic devices.
	A2405.3 Measure the ripple content present in rectifiers with and without filters.

	A2405.4 Construct single stage amplifier circuits and plot transient and frequency response.
7.	A2406 Digital Logic Design Laboratory
	A2406.1 Make use of LabVIEW software to construct combinational and sequential circuits.
	A2406.2 Test and Debug the combinational and sequential circuits using LabVIEW Software.
	A2406.3 Analyze virtual lab demo for Boolean relations using digital comparators.
	A2406.4 Develop LabVIEW based projects using LabVIEW Software.
8.	A2407 Basic Simulation Laboratory
	A2407.1 Develop programs to generate different signals.
	A2407.2 Compile programs to perform different operations on signals and sequences.
	A2407.3 Analyze different responses of the systems and spectrums of the signals.
	A2407.4 Test the different properties of given signals and systems.
	A2407.5 Estimate the mean skew, kurtosis, and probability distribution function of Gaussian noise.
9.	A2017 Quantitative Aptitude and Reasoning – I
	A2017.1 Identify the problems by applying mathematical fundamentals.
	A2017.2 Apply the suitable logical methods to solve the problems.
	A2017.3. Solve the various problems by using quantitative mathematical fundamentals.
	A2017.4 Analyse the comprehensive data with logical ability.
10.	A2032 Human Values and Professional Ethics
	A2032.1 Apply human values and ethics in professional life.
	A2032.2 Develop the moral ideals to maintain good relationships with people.
	A2032.3 Solve environmental related problems by keeping health of human being into consideration.
	A2032.4 Make use of the fundamental rights and human rights in life for individual dignity
	A2032.5 Build the sound health system both physically and mentally by practicing yoga, karate, sports etc.

COURSE OUTCOMES-R19 REGULATION

IV

S.NO	Course Outcomes (COs)
1.	A2213 Control Systems
	A2213.1 Determine the transfer function of a given system using different techniques. A2213.2 Analyze the response of a given system in time and frequency domains. A2213.3 Test the stability, observability and controllability of a given system. A2213.4 Apply suitable technique for calculating the gain margin and phase margin of a given system.
2.	A2410 Electromagnetics and Transmission Lines
	A2410.1 Apply various laws of electrostatics and magnetostatics to deduce Maxwell's equations in static and time variants fields. A2410.2 Develop boundary conditions for different combinations of media. A2410.3 Make use of Maxwell's equations to deduce EM wave equations. A2410.4 Develop expressions for primary and secondary parameters of transmission line using conventional and graphical methods. A2410.5 Derive continuity equation, Poisson's, Laplace's equation and Poynting theorem to characterize field.
3.	A2411 Electronic Circuit Analysis
	A2411.1 Analyze the small signal models of BJT amplifiers at high frequencies. A2411.2 Analyze the frequency response of single and multi-stage amplifiers with compound connections. A2411.3 Classify amplifiers based on feedback mechanism. A2411.4 Evaluate the efficiency of large signal amplifiers. A2411.5 Explain the concept of resonant frequency in tuned amplifiers.
4.	A2412 Analog Communication Systems
	A2412.1 Explain the operation of different analog communication systems. A2412.2 Analyze the performance of different modulation schemes used in analog communication systems. A2412.3 Make use of sampling theorem to generate pulse modulation signals. A2412.4 Analyze the performance of AM, FM and PM receivers in the presence of noise. A2412.5 Choose an appropriate modulation technique to design an analog communication system.
5.	A2413 Internet of Things
	A2413.1 Analyze IoT applications using IoT design principles, protocols and levels. A2413.2 Distinguish sensors and actuators in terms of their functions and applications. A2413.3 Interface I/O devices, Sensors using Arduino. A2413.4 Apply Python concepts for programming of Raspberry Pi. A2413.5 Develop IoT applications using Raspberry Pi and Arduino.
6.	A2414 Electronic Circuit Analysis Laboratory
	A2414.1 Design single and multistage amplifiers at low, mid and high frequencies. A2414.2 Determine the gain of feedback amplifiers and efficiency of power amplifiers. A2414.3 Design oscillator circuits for given frequency of oscillation. A2414.4 Compare the frequency response of tuned amplifiers. A2414.5 Analyze all the electronic circuits using simulation software and hardware.
7.	A2415 Analog Communication Systems Laboratory

	<p>A2415.1 Analyze the performance of different continuous modulation and demodulation schemes.</p> <p>A2415.2 Sketch the characteristics of mixer, pre-emphasis and de-emphasis.</p> <p>A2415.3 Compute the specifications of a phase locked loop.</p> <p>A2415.4 Analyze the performance of different pulse modulation Schemes.</p>
8.	A2416 Internet of Things Laboratory
	<p>A2416.1 Develop embedded C Programs using Arduino UNO and IDE.</p> <p>A2416.2 Execute Arduino C programs for blink LED, push button, potentiometer, fadeldr, serial interface, LCD, DHT sensor.</p> <p>A2416.3 Build Programs of Raspberry-Pi using python.</p> <p>A2416.4 Interface LEDs, Push Buttons, Potentiometer to Raspberry-Pi.</p> <p>A2416.5 Test and Debug Arduino UNO embedded C and Raspberry-Pi python Programs.</p>
9.	A2018 Quantitative Aptitude and Reasoning – II
	<p>A2018.1 Identify the problems by applying mathematical fundamentals.</p> <p>A2018.2 Apply the suitable logical method to solve the problems.</p> <p>A2018.3. Solve the various problems by using quantitative mathematical fundamentals.</p> <p>A2018.4 Analyse the comprehensive data with logical ability.</p>
10.	A2417 Socially Relevant Project – I
11.	A2418 Comprehensive Assessment – I
12.	A2031 Environmental Science
	<p>A2031.1 Solve environmental problems through higher level of personal involvement and interest.</p> <p>A2031.2 Apply ecological morals to keep up amicable connection among nature and human beings.</p> <p>A2031.3 Recognize the interconnectedness of human dependence on the earth's ecosystems.</p> <p>A2031.4 Apply environmental laws for the protection of environment and wildlife.</p> <p>A2031.5 Influence society in proper utilization of goods and services.</p>

COURSE OUTCOMES-R19 REGULATION

V

S.NO	Course Outcomes (COs)
1.	A2421 Antennas and Wave Propagation
	A2421.1 Compare the performance of different antennas using antenna parameters.
	A2421.2 Analyze dipole and array antennas by computing fields, radiated power and radiation resistance.
	A2421.3 Select appropriate antenna for a specific application like TV, AM/FM radio, radar, satellite link.
	A2421.4 Design horn, helical and reflector antennas for VHF, UHF and microwave communication applications.
	A2421.5 Formulate the design equations of microstrip antennas for a given application.
2.	A2422 Linear Integrated Circuit Applications
	A2422.1 Analyze the characteristics of operational amplifier.
	A2422.2 Design different amplifier and oscillator circuits using op-amp.
	A2422.3 Make use of IC 555 and PLL effectively in communication systems.
	A2422.4 Construct different active filters using op-amp.
	A2422.5 Design different analog to digital and digital to analog converters effectively.
3.	A2423 Digital Communication Systems
	A2423.1 Analyze different digital modulation techniques to convert analog signals to digital form.
	A2423.2 Distinguish between baseband and passband transmission techniques in terms of SNR and BER.
	A2423.3 Examine the concepts of geometric representation of signals and constellation diagrams.
	A2423.4 Compare digital carrier modulation schemes in terms of bandwidth, complexity and spectral efficiency.
	A2423.5 Interpret the differences between linear block codes and convolutional codes for noisy and noiseless channels.
4.	Professional Elective – I
	A2451 Optical Communications
	A2451.1 Analyze different optical propagation methods and understand cylindrical fibers and mode configurations
	A2451.2 Differentiate various fabrication methods used in optical fibers and factors causing signal distortion
	A2451.3 Evaluate the signal degradation at fiber joints and fiber splices
	A2451.4 Describe the characteristics of optical sources and detectors, and power launching capability of optical fiber
	A2451.5 Evaluate the power penalties by system considerations in the link, error control corrections and detections
5.	A2452 Nanotechnology
	A2452.1 Distinguish between different types of materials and their properties.
	A2452.2 Compare different types of nanomaterials.
	A2452.3 Analyze different properties of nanomaterial.
	A2452.4 Contrast between different types of carbon nanotubes.

6.	A2454 Real Time Operating Systems
	A2454.1 Analyze the Computer hardware organization and operating System components.
	A2454.2 Understand real time concepts and hardware considerations.
	A2454.3 Make use power management concepts for rtos.
	A2454.4 Apply the Inter process communication algorithms to avoid deadlocks. A2454.5 Utilize the memory algorithms for memory management.
7.	Open Elective – I
	A2283 Electrical Measuring Instruments
	A2283.1 Categorise various electrical instruments used for measuring electrical parameters.
	A2283.2 Design appropriate arrangement for extension of range in measuring instruments.
	A2283.3 Analyze the errors and compensations in various electrical measuring instruments.
8.	A2283.4 Measure current, voltage, power and energy in 1-phase and 3-phase circuits.
	A2283.5 Estimate the unknown quantities of resistance, inductance and capacitance using bridges.
	A2424 Linear Integrated Circuit ApplicationsLaboratory
	A2424.1 Implement different configurations of operational amplifiers.
	A2424.2 Generate various shapes of signals using op-amps and timers.
9.	A2424.3 Construct and analyse various active filters and data converters using op-amp.
	A2424.4 Analyze the characteristics and applications of PLL.
	A2425 Digital Communication SystemsLaboratory
	A2425.1 Demonstrate the working of various digital modulation and demodulation schemes.
	A2425.2 Design various digital modulation schemes to obtain desired modulation index.
10.	A2425.3 Analyze the performance of time division multiplexing and de-multiplexing.
	A2425.4 Study and verify sampling theorem.
	A2425.5 Verify digital modulation techniques using MATLAB.
	A2426 Digital Design through Verilog HDLLaboratory
	A2426.1 Develop hardware digital designs using Verilog HDL A2426.2 Use various modeling styles appropriately for digital design
11.	A2426.3 Design, simulate and synthesize combinational circuits using Verilog descriptions
	A2426.4 Design, simulate and synthesize sequential circuits using Verilog descriptions
	A2426.5 Use finite state machines to design complex circuits
	A2016 Professional English CommunicationSkills Laboratory
	A2016.1 Able to use language effectively in everyday conversations
A2016.2 Able to get exposed various environments	
A2016.3 Able to pronounce correctly	
A2016.4 Able to acquire fluency in spoken English	
A2016.5 Able to translate from mother tongue to English effectively	

	A2016.6 Able to face interviews/ GD to acquire proficiency towards employability
12.	A2033 Indian Constitution
	A2033.1 Understand historical background of the constitution making and its importance for building a democratic India.
	A2033.2 Explain the role of President and Prime Minister.
	A2033.3 Understand the functioning of three wings of the government ie., executive, legislative and judiciary.
	A2033.4 Understand the value of the fundamental rights and duties for becoming good citizen of India
	A2033.5 Analyze the decentralization of power between central, state and local self-government.
	A2033.6 Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy.

COURSE OUTCOMES-R19 REGULATION

VI

S.NO	Course Outcomes (COs)
	A2427 Digital Signal Processing
1.	A2427.1 Apply the Discrete Fourier Transform to represent the signals in frequency domain.
	A2427.2 Analyze various DFT algorithms and their applications.
	A2427.3 Analyze various realization forms of FIR and IIR Filters.
	A2427.4 Design digital FIR and IIR filters and analyze their performances.
	A2427.5 Apply the concepts of multirate signal processing to implement digital filters.
	A2428 CMOS VLSI Design
2.	A2428.1 Analyze the electrical properties of MOS transistors
	A2428.2 Apply various CMOS processing techniques to fabricate NMOS, PMOS and CMOS devices
	A2428.3 Analyze the DC and transient characteristics of CMOS logic gates
	A2428.4 Build logic circuits using transmission gate logic
	A2428.5 Make use of charge leakage and charge sharing concepts to design dynamic logic circuits
	A2429 Microprocessors and Microcontrollers
3.	A2429.1 Analyze 8086 microprocessor and MSP430 microcontroller architectures.
	A2429.2 Develop programs using 8086 microprocessor and MSP430 microcontroller.
	A2429.3 Make use of peripherals of MSP430 to interface I/O devices.
	A2429.4 Apply serial communication protocols for interfacing serial devices.
	A2429.5 Design embedded applications using MSP430 microcontroller.
	Professional Elective – II
	A2455 Microwave Engineering
4.	A2455.1 Analyze rectangular waveguide transmission line characteristics using concepts of Electromagnetic theory.
	A2455.2 Evaluate relation between input(s) and output(s) of microwave passive components using scattering parameters.
	A2455.3 Compare performance of O-type and M-type microwave tubes.
	A2455.4 Sketch the characteristics of microwave solid state devices
	A2455.5 Measure microwave parameters using microwave bench setup.
	A2456 Biomedical Signal Processing
	A2456.1 Analyze the nature of biomedical signals and related concepts.
	A2456.2 Apply averaging technique on biomedical signals and extract the features.
	A2456.3 Design various time domain filtering techniques for the removal of artefact from biomedical signal.
	A2456.4 Apply signal compression techniques on biomedical signals.
	A2456.5 Analyze event detection techniques for EEG and ECG signals.
	A2457 FPGA Design
	A2457.1 Discuss different PLDs based on real time applications and compare its architectures.
	A2457.2 Analyze the programmable technologies used in FPGAs.
	A2457.3 Design combinational and sequential circuits using FPGA.
	A2457.4 Distinguish between technology dependent and technology independent optimizations while implementing logic in FPGA.
	A2457.5 Make use of finite state machines to design applications on FPGA.

	Open Elective – II
	A2582 Fundamentals of DBMS
5.	<p>A2582.1 Apply suitable data models for given application.</p> <p>A2582.2 Design database using integrity constraints and ACID properties.</p> <p>A2582.3 Construct optimized SQL queries to solve real time problems.</p> <p>A2582.4 Apply suitable normal form to eliminate data redundancy.</p> <p>A2582.5 Choose appropriate index structure to improve performance.</p>
6.	A2430 Digital Signal Processing Laboratory
	<p>A2430.1 Evaluate the DFT and IDFT of given signals using MATLAB.</p> <p>A2430.2 Analyze various DFT algorithms and their applications.</p> <p>A2430.3 Design IIR and FIR digital filters for the given specifications using MATLAB.</p> <p>A2430.4 Apply the concepts of multirate signal processing using MATLAB.</p> <p>A2430.5 Demonstrate real-time signal Processing applications with DSK kit (TMS320C6713) and Code Composer Studio.</p>
7.	A2539 JAVA Programming Laboratory
	<p>A2509.1 Design solutions for the problems of general purpose applications using object oriented concepts</p> <p>A2509.2 Generate reusable code using inheritance, user defined packages and interfaces</p> <p>A2509.3 Write robust and efficient code using exception handling and multithreading concepts</p> <p>A2509.4 Implement collection frameworks and file handling techniques to store and retrieve data</p> <p>A2509.5 Design user interface using swings</p>
8.	A2431 Microprocessors & Microcontrollers Laboratory
	<p>A2431.1 Develop assembly language programs using EMU8086 emulator.</p> <p>A2431.2 Execute 8086 ALPs for arithmetic, logical, string, call operations.</p> <p>A2431.3 Build programs of MSP430 using embedded C.</p> <p>A2431.4 Interface LEDs, push buttons, potentiometer to MSP430.</p> <p>A2431.5 Test and debug 8086 ALPs and MSP430 embedded C programs.</p>
9.	A2432 Socially Relevant Project – II
10.	A2433 Comprehensive Assessment – II
11.	A2034 Gender Sensitization
	<p>A2034.1 Develop a better understanding of important issues related to gender in contemporary India</p> <p>A2034.2 Sensitize to basic dimensions of the biological, sociological, psychological and legal aspects of gender</p> <p>A2034.3 Acquire insight into the gendered division of labour and its relation to politics and economics</p> <p>A2034.4 Equip to work and live together as equals</p> <p>A2034.5 Develop a sense of appreciation of women in all walks of life</p>

COURSE OUTCOMES-R19 REGULATION

VII

S.NO	Course Outcomes (COs)
1.	A2019 Managerial Economics and Financial Analysis
	A2019.1 Analyze the concepts of managerial economics and financial accounting to make better decisions in the organization.
	A2019.2 Analyze the demand, production, cost and break even to know interrelationship among variables and their impact.
	A2019.3 Classify the market structure to decide the fixation of suitable price.
	A2019.4 Apply capital budgeting techniques to select best investment opportunity.
	A2019.5 Analyze and prepare financial statements to assess financial health of business.
2.	A2434 Digital Image Processing
	A2434.1 Demonstrate different operations on image pixels.
	A2434.2 Distinguish between different types of image transforms.
	A2434.3 Compare different image enhancement techniques.
	A2434.4 Apply different techniques to perform image segmentation.
	A2434.5 Contrast between different color models and compression techniques.
3.	A2435 Embedded Systems
	A2435.1 Analyze the embedded systems features and architecture considerations
	A2435.2 Develop Programs using TM4C123GH6PM Microcontroller
	A2435.3 Make use of Peripherals of TM4C123GH6PM to interface I/O Devices
	A2435.4 Apply Serial Communication Protocols for interfacing serial Devices.
	A2435.5 Design Embedded Applications using TM4C123GH6PM Controller
4.	A2436 Embedded Systems Lab
	A2436.1 Build Embedded C Programs using TM4C123GH6PM microcontroller.
	A2436.2 Execute TM4C123GH6PM Programs using Code Composer Studio.
	A2436.3 Interface LEDs, Push Buttons, Potentiometer to TM4C123GH6PM.
	A2436.4 Test and Debug TM4C123GH6PM Programs using Code Composer Studio.
	A2436.5 Develop embedded systems applications using TM4C123GH6PM.
5.	Professional Elective – 3
	A2459 Cellular and Mobile Communications
	A2459.1 Analyze the cellular mobile system design concepts to improve the signal to noiseRatio and cell coverage.
	A2459.2 Interpret the Co-channel interferences and their parameters to improve the system capacity.
	A2459.3 Illustrate the importance of cell coverage for signal and traffic, diversity techniques and mobile antennas to a caller.
	A2459.4 Utilize the Omni directional and directional antennas to improve the channel capacity and interference reduction.
	A2459.5 Demonstrate the Interim Standard, Digital Enhanced Cordless System, multiple access schemes of the wireless networks and standards and types of handoff.
	A2461 Low Power VLSI Design
	A2461.1 Comprehend different sources of power dissipation.
	A2461.2 Realize switched capacitance and arrive at ways to minimize.
A2461.3 Analyze and minimize dynamic and static power consumption in VLSI circuits.	
A2461.4 Outline the working principles of adiabatic logic.	

	A2461.5 Establish ways to minimize power in software design.
6.	A2583 Basics of Software Engineering
	A2583.1 Apply the phases of software development life cycle in application development.
	A2583.2 Identify software requirements for construction.
	A2583.3 Design requirement engineering process for change management.
	A2583.4 Apply the design concepts for design models.
	A2583.5 Construct the various testing techniques for software systems.
7.	A2437 Mini-Project/Internship
8.	A2438 Project Work Phase – I

COURSE OUTCOMES-R19 REGULATION

VII

S.NO	Course Outcomes (COs)
	Professional Elective – 4
	A2463 Satellite Communications
	A2463.1 Analyze the functionality of various elements of satellite communication system.
	A2463.2 Apply launching procedures and Ephemeris data to place and locate satellite in the orbit.
	A2463.3 Create link budgets to meet specific objectives for C/N.
1.	A2463.4 Analyze the various GNSS constellations used for navigation.
	A2463.5 Differentiate various access techniques used for communication.
	A2466 Embedded System Design
	A2466.1 Understand the basics of an embedded system
	A2466.2 Understand the typical components of an embedded system.
	A2466.3 To understand different communication interfaces.
	A2466.4 To learn the design process of embedded system applications.
	A2466.5 To understand the RTOS and inter-process communication.
	A2485 CISCO Networking
	A2583.1 Analyze the layers of reference models used for communication in various networks.
2.	A2583.2 Apply the principles of error detection and correction to transfer data without errors.
	A2583.3 Interpret various IEEE standards and channelization protocols.
	A2583.4 Analyze the issues with host naming, addressing, and routing packets in internet.
	A2583.5 Inspect the process to delivery data using TCP and UDP in transport layer.
3.	A2439 Project Work Phase – II