

**G.PULLAIAH COLLEGE OF ENGINEERING AND TECHNOLOGY::KURNOOL  
(AUTONOMOUS)  
ACCREDITED BY NAAC 'A' GRADE OF UGC AND NBA OF AICTE  
DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING**

**COURSE OUTCOMES-R18 REGULATION**

**III**

| S.NO | Course Outcomes (COs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1.   | <p><b>A1014 Linear Algebra and Complex Variables</b></p> <p>CO1 Demonstrate knowledge of matrix calculation as an elegant and powerful mathematical language in connection with rank of a matrix, linear system of equations, linear dependence and independence</p> <p>CO2 Interpret the Eigen values and Eigen vectors of matrix in terms of the transformation it represents in to a matrix Eigen value problem.</p> <p>CO3 Define a quadratic form and determine its nature using Eigen values. Apply Beta and Gamma functions to evaluate many integrals which cannot be expressed in terms of elementary functions.</p> <p>CO4 Analyze the functions of complex variable which include continuity, differentiability and analyticity along with evaluation of Cauchy-Riemann equations in Cartesian and polar coordinates.</p> <p>CO5 Employ the Cauchy's integral theorem along with integral formula along with expansion in Taylor's series, Maclaurin's series and Laurent series.</p> <p>CO6 Evaluate the residual formula through Laurent series and residue theorem along with evaluation of improper real integrals.</p> |
| 2.   | <p><b>A1401 Electronic Devices and Circuits</b></p> <p>CO1 Understand the operation and characteristics of PN diode with diode's applications in electronic circuits.</p> <p>CO2 Formulate the electrical models for special semiconductor diodes like Tunnel diode, LED and Photodiode.</p> <p>CO3 Analyze various rectifiers and filter circuits used in regulated power supplies.</p> <p>CO4 Compare and contrast the construction, working principles, characteristics and applications of major electronic devices like BJT, FET and MOSFET.</p> <p>CO5 Design and analyze the DC bias circuitry of BJT.</p> <p>CO6 Design and analyze the small signal models of BJT &amp; FET Amplifiers at low frequencies.</p>                                                                                                                                                                                                                                                                                                                                                                                                                |
| 3.   | <p><b>A1402 Digital Logic Design</b></p> <p>CO1 Understand common forms of number representation in logic circuits.</p> <p>CO2 Make use of Boolean algebra postulates-map and tabulation methods to minimize boolean functions and to implement with logic gates.</p> <p>CO3 Construct and analyze various combinational circuits used in digital systems such as adders, subtractors and code-convertors.</p> <p>CO4 Construct and analyze various combinational circuits used in digital systems such as decoders, encoders, and data selectors.</p> <p>CO5 Construct and analyze various sequential circuits used in digital systems such as flip-flops, registers and counters.</p> <p>CO6 Design various PLDs such as ROMs, PALs, PLAs and PROMs.</p>                                                                                                                                                                                                                                                                                                                                                                             |
| 4.   | <p><b>A1403 Signals and Systems</b></p> <p>CO1 Understand the concepts of different signals and systems in continuous &amp; discrete time domains.</p> <p>CO2 Find the Fourier series representation of different Periodic signals.</p> <p>CO3 Plot the spectrum of continuous time signals and verify the sampling theorem for low pass signals.</p> <p>CO4 Evaluate the Fourier transform of Discrete-time signals and prove the properties of DTFT.</p> <p>CO5 Find the response of LTI &amp; LTV systems and distinguish between signal &amp; system bandwidths.</p> <p>CO6 Understand the stability of systems through the ROC concept of Laplace and Z-transforms.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 5.   | <p><b>A1404 Probability Theory and Stochastic Processes</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

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|           | <p>CO1 Recall the basic parameters like probability concepts, principles of random variables</p> <p>CO2 Apply probability distribution and density functions to evaluate the performance of</p> <p>CO3 Describe the characteristics of real, physical world random phenomenon.</p> <p>CO4 Evaluate practical probabilistic problems involving random input signals.</p> <p>CO5 Illustrate about processes by means of autocorrelation, cross correlation and covariance functions.</p> <p>CO6 Describe the performance of systems with random signals &amp; understand the concept of Noise as applicable to linear Systems.</p> |
| <b>6.</b> | <p><b>A1405 Electronic Devices and Circuits Laboratory</b></p> <p>CO1 Analyze the description of CRO and Function generator panels.</p> <p>CO2 Find the cut-in voltage, static and dynamic resistances from V-I characteristics of PN junction diode.</p> <p>CO3 Find the breakdown voltage and Regulation characteristics of Zener diode.</p> <p>CO4 Compute the ripple content present in half wave and full wave rectifiers with and without filters.</p> <p>CO5 Plot the characteristics of BJT and FET.</p> <p>CO6 Draw the frequency response of single stage amplifiers at low, mid and high frequencies.</p>             |
| <b>7.</b> | <p><b>A1406 Digital Logic Design Laboratory</b></p> <p>CO1 Design digital logic circuits using NI Lab VIEW software.</p> <p>CO2 Verify the logical operations of the digital ICs in the laboratory.</p> <p>CO3 Analyze the functionality of Combinational circuits using NI Lab VIEW.</p> <p>CO4 Analyze the functionality of Sequential Circuits using NI Lab VIEW.</p> <p>CO5 Design and analyze the code converters using NI Lab VIEW.</p> <p>CO6 Analyze the functionality of Combinational circuits and Sequential Circuits using Virtual lab.</p>                                                                          |
| <b>8.</b> | <p><b>A1407 Basic Simulation Laboratory</b></p> <p>CO1 Generate different signals and sequences using MATLAB</p> <p>CO2 Perform correlation and convolution of signals and sequences</p> <p>CO3 Find the Fourier and Laplace transform of the given functions</p> <p>CO4 Plot the pole-zero map of the given transfer function in S &amp; Z planes</p> <p>CO5 Find mean and variance &amp; check the wide sense stationary of the Stochastic process</p> <p>CO6 Remove the noise by auto correlation / cross correlation in a given signal corrupted by noise.</p>                                                               |
| <b>9.</b> | <b>A1013 Verbal Ability &amp; Logical Reasoning</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

### COURSE OUTCOMES-R18 REGULATION

#### IV

| S.NO | Course Outcomes (COs)                      |
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| 1.   | <b>A1408 – Electronic Circuit Analysis</b> |
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|  | <p>CO1 Design and analyze the small signal models of BJT&amp; FET Amplifiers at high frequencies.</p> <p>CO2 Analyze the frequency response of single &amp; multi-stage amplifiers with compound connections.</p> <p>CO3 Understand and analyze the basic analog building blocks of Feedback Amplifiers.</p> <p>CO4 Design basic analog building blocks for LC and RC oscillator Circuits.</p> <p>CO5 Evaluate the efficiency of Large signal or Power amplifiers.</p> <p>CO6 Explain the concept of tuned amplifiers &amp; evaluate the resonant frequency for tuned amplifiers.</p>                                                                                                                                                                                                                                                                 |
|  | <p><b>A1409– Analog Communication Systems</b></p> <p>CO1 To Understand the basic concepts of the analog communication systems.</p> <p>CO2 To Analyze various analog continuous wave modulation and demodulation techniques including AM, FM and PM.</p> <p>CO3 Evaluate the performance of the communication system in the presence of noise.</p> <p>CO4 Analyze various analog pulse modulation and demodulation techniques including AM, FM and PM.</p> <p>CO5 To calculate information rate and channel capacity of a discrete communication channel .</p> <p>CO6 To Acquire life long experience in doing projects related to communication systems.</p>                                                                                                                                                                                          |
|  | <p><b>A1410 – Electromagnetic Theory and Transmission Lines</b></p> <p>CO1 State Coulomb’s law and Gauss’s law based on electrostatic fields and write the Maxwell’s equations.</p> <p>CO2 Explain Ampere’s law in magneto static fields and write the Maxwell’s equations.</p> <p>CO3 Explain the Faraday’s law and understand the four Maxwell’s equations for time- varying fields</p> <p>CO4 Apply the Maxwell’s equations and analyze the reflection and refraction of electromagnetic waves propagated in normal and oblique incidences</p> <p>CO5 Understand the properties of different types of transmission lines</p> <p>CO6 Understand how to treat the transmission lines as circuit elements possessing complex impedances that are functions of line length and frequency</p>                                                           |
|  | <p><b>A1211– Control Systems</b></p> <p>CO1 Differentiate the open loop and closed loop control system along with understanding of fundamental concepts like signal flow graph and Mason’s gain formula and also representing the transfer function of AC and DC servomotor.</p> <p>CO2 Analyze the time response of both first order and second order systems along with the designing of various controllers</p> <p>CO3 Apply the concepts of stability through Root locus technique, R-H Criterion in s-domain</p> <p>CO4 Plot the phase and magnitude of various systems employing Bode plot, Nyquist plot and polar plot</p> <p>CO5 Design compensation techniques which involve lag, lead and lead-lag type.</p> <p>CO6 Derive the State models from schematic models along with diagonalization and formulation of state transition matrix</p> |
|  | <p><b>A1216 – Electrical Technology</b></p> <p>CO1 State and define the basic laws related to operating principle of DC and AC machines, and Classify the types based on its applications.</p> <p>CO2 Analyze the constructional details and principle of operation of DC machines and also depict their characteristics.</p> <p>CO3 Implement the concept of speed control of DC motors along with evaluation of efficiency.</p> <p>CO4 Compute the equivalent circuit parameters of single phase transformer and conduct the tests to determine the efficiency and regulation.</p> <p>CO5 Analyze the constructional parts and principle of operation of AC machines with their characteristics. Apply the method employed in determination of voltage regulation of an alternator.</p>                                                             |
|  | <p><b>6. A1411 – Electronic Circuit Analysis Laboratory</b></p> <p>CO1 Analyze and design multistage amplifiers at low, mid and high frequencies.</p> <p>CO2 Find the gain of feedback amplifiers.</p> <p>CO3 Design RC and LC oscillators.</p> <p>CO4 Determine the efficiencies of power amplifiers.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

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|            | <p>CO5 Draw the frequency response of tuned amplifiers.</p> <p>CO6 Able to Analyze all the circuits using simulation software and Hardware.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>7.</b>  | <p><b>A1412 - Analog Communication Systems Laboratory</b></p> <p>CO1 Design different types of modulators and demodulators for analog continuous wave modulation.</p> <p>CO2 Design FM modulator and demodulator</p> <p>CO3 Design Phase Locked Loop</p> <p>CO4 Study the characteristics of a mixer</p> <p>CO5 Design pre-emphasis and de-emphasis circuits</p> <p>CO6 Design different types of modulators and demodulators for analog pulse modulation.</p>                                                                                                                                                                                                  |
| <b>8.</b>  | <p><b>A1217 - Electrical Technology Laboratory</b></p> <p>CO1 Conduct experiments to obtain the no load and load characteristics of Dc Generators and Identify the reason as to why DC Generator is not building up voltage.</p> <p>CO2 Conduct test on DC Motors for Predetermination of efficiency.</p> <p>CO3 Control the speed of DC Motor in a given range using appropriate method.</p> <p>CO4 Compute the Performance of Single Phase Transformer along with its equivalent circuit parameters.</p> <p>CO5 Acquire good practical knowledge about the operation , testing and characteristics of A.C equipment like Induction Motors and Alternators</p> |
| <b>9.</b>  | <b>A1012 - Quantitative Aptitude-1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>10.</b> | <b>A1413 - Comprehensive Online Examination</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## COURSE OUTCOMES-R18 REGULATION

V

| S.NO | Course Outcomes (COs)                                                                                                      |
|------|----------------------------------------------------------------------------------------------------------------------------|
| 1.   | <b>A1701 Managerial Economics and Financial Analysis</b>                                                                   |
|      | A1701.1 Analyze the concepts of managerial economics and financial accounting to make better decisions in the organization |
|      | A1701.2 Analyze the demand, production, cost and break even to know interrelationship among variables and their impact     |
|      | A1701.3 Classify the market structure to decide the fixation of suitable price                                             |
|      | A1701.4 Apply capital budgeting techniques to select best investment opportunity                                           |
|      | A1701.5 Analyze and prepare financial statements to assess financial health of business                                    |
| 2.   | <b>A1418 Antennas and Wave Propagation</b>                                                                                 |
|      | A1418.1 Compare the performance of different antennas using antenna parameters                                             |
|      | A1418.2 Analyze dipole and array antennas by computing fields, radiated power and radiation resistance                     |
|      | A1418.3 Select appropriate antenna for a specific application like TV, AM/FM radio, radar, satellite link                  |
|      | A1418.4 Design horn, helical and reflector antennas for VHF, UHF and microwave communication applications                  |
|      | A1418.5 Formulate the design equations of microstrip antennas for a given application                                      |
| 3.   | <b>A1419 Digital Communication Systems</b>                                                                                 |
|      | A1419.1 Analyze different digital modulation techniques to convert analog signals to digital form.                         |
|      | A1419.2 Distinguish between baseband and passband transmission techniques in terms of SNR and BER.                         |
|      | A1419.3 Examine the concepts of geometric representation of signals and constellation diagrams.                            |
|      | A1419.4 Compare digital carrier modulation schemes in terms of bandwidth, complexity and spectral efficiency.              |
|      | A1419.5 Interpret the differences between linear block codes and convolutional codes for noisy and noiseless channels.     |
| 4.   | <b>A1420 Linear Integrated Circuit Applications</b>                                                                        |
|      | A1420.1 Analyze the characteristics of operational amplifier.                                                              |
|      | A1420.2 Design different amplifier and oscillator circuits using op-amp.                                                   |
|      | A1420.3 Make use of IC 555 and PLL effectively in communication systems.                                                   |
|      | A1420.4 Construct different active filters using op-amp.                                                                   |
|      | A1420.5 Design different analog to digital and digital to analog converters effectively.                                   |
| 5.   | <b>Professional Elective – 1</b>                                                                                           |
|      | <b>A1451 Data Communications and Networking</b>                                                                            |
|      | A1451.1 Analyze the layers of reference models used for communication in various networks.                                 |
|      | A1451.2 Apply the principles of error detection and correction to transfer data without errors.                            |
|      | A1451.3 Interpret various IEEE standards and channelization protocols.                                                     |
|      | A1451.4 Analyze the issues with host naming, addressing, and routing packets in internet.                                  |
|      | A1451.5 Inspect the process to delivery data using TCP and UDP in transport layer.                                         |
|      | <b>A1452 Electronic Measurements and Instrumentation</b>                                                                   |
|      | A1452.1 Analyze the performance characteristics of different measurement instruments and their errors.                     |
|      | A1452.2 Analyze the function of CRO used to measure frequency, amplitude and phase.                                        |
|      | A1452.3 Compare the operation of different signal generators and wave form analysers.                                      |
|      | A1452.4 Select an appropriate bridge network for the measurement of electrical quantities.                                 |
|      | A1452.5 Make use of Sensors and transducers to measure the required physical quantities.                                   |
|      | <b>A1453 Advanced Digital System Design</b>                                                                                |

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|            | <p>A1453.1 Compare the performance of various digital logic families.</p> <p>A1453.2 Analyze the sequential circuits using state reduction techniques.</p> <p>A1453.3 Apply the sequential network to solve synchronous &amp; asynchronous design behaviour.</p> <p>A1453.4 Design advanced digital systems using finite state machines.</p> <p>A1453.5 Design complex circuits using programmable logic devices.</p>                                                                                 |
|            | <b>A1454 Internet of Things</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|            | <p>A1454.1 Analyze IoT applications using IoT design principles, protocols and levels.</p> <p>A1454.2 Distinguish sensors and actuators in terms of their functions and applications.</p> <p>A1454.3 Interface I/O devices, Sensors using Arduino.</p> <p>A1454.4 Apply Python concepts for programming of Raspberry Pi.</p> <p>A1454.5 Develop IoT applications using Raspberry Pi and Arduino.</p>                                                                                                  |
| <b>6.</b>  | <b>Open Elective – 1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|            | <b>A1283 Electrical Measuring Instruments</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|            | <p>A1283.1 Categorise various electrical instruments used for measuring electrical parameters.</p> <p>A1283.2 Design appropriate arrangement for extension of range in measuring instruments.</p> <p>A1283.3 Analyze the errors and compensations in various electrical measuring instruments.</p> <p>A1283.4 Measure current, voltage, power and energy in 1-phase and 3-phase circuits.</p> <p>A1283.5 Estimate the unknown quantities of resistance, inductance and capacitance using bridges.</p> |
| <b>7.</b>  | <b>A1421 Digital Design through Verilog HDL Laboratory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|            | <p>A1421.1 Develop hardware digital designs using Verilog HDL</p> <p>A1421.2 Use various modeling styles appropriately for digital design</p> <p>A1421.3 Design, simulate and synthesize combinational circuits using Verilog descriptions</p> <p>A1421.4 Design, simulate and synthesize sequential circuits using Verilog descriptions</p> <p>A1421.5 Use finite state machines to design complex circuits</p>                                                                                      |
| <b>8.</b>  | <b>A1422 Digital Communication Systems Laboratory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|            | <p>A1422.1 Demonstrate the working of various digital modulation and demodulation schemes.</p> <p>A1422.2 Design various digital modulation schemes to obtain desired modulation index.</p> <p>A1422.3 Analyze the performance of time division multiplexing and de-multiplexing.</p> <p>A1422.4 Study and verify sampling theorem.</p> <p>A1422.5 Verify digital modulation techniques using MATLAB.</p>                                                                                             |
| <b>9.</b>  | <b>A1423 Linear Integrated Circuit Applications Laboratory</b>                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|            | <p>A1423.1 Implement different configurations of operational amplifiers.</p> <p>A1423.2 Generate various shapes of signals using op-amps and timers.</p> <p>A1423.3 Construct and analyse various active filters and data converters using op-amp.</p> <p>A1423.4 Analyze the characteristics and applications of PLL.</p>                                                                                                                                                                            |
| <b>10.</b> | <b>A1016 Advanced English Language Communication Skills</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|            | <p>A1016.1 Build inferences and predictions based on the information provided in the context.</p> <p>A1016.2 Choose academic vocabulary appropriately both in speaking and in writing.</p> <p>A1016.3 Develop effective technical writing skills.</p> <p>A1016.4 Construct necessary skills to deliver presentation confidently for improving in respective domains.</p> <p>A1016.5 Apply language structures to construct good relations.</p>                                                        |

## COURSE OUTCOMES-R18 REGULATION

### VI

| S.NO                                                                                                                             | Course Outcomes (COs)                                                                                                 |
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| 1.                                                                                                                               | <b>A1425 Digital Signal Processing</b>                                                                                |
|                                                                                                                                  | A1425.1 Apply the Discrete Fourier Transform to represent the signals in frequency domain.                            |
|                                                                                                                                  | A1425.2 Analyze various DFT algorithms and their applications.                                                        |
|                                                                                                                                  | A1425.3 Analyze various realization forms of FIR and IIR Filters.                                                     |
|                                                                                                                                  | A1425.4 Design digital FIR and IIR filters and analyse their performances.                                            |
|                                                                                                                                  | A1425.5 Apply the concepts of multirate signal processing to implement digital filters.                               |
| 2.                                                                                                                               | <b>A1426 CMOS VLSI Design</b>                                                                                         |
|                                                                                                                                  | A1426.1 Analyze the electrical properties of MOS transistors.                                                         |
|                                                                                                                                  | A1426.2 Apply various CMOS processing techniques to fabricate NMOS, PMOS and CMOS devices.                            |
|                                                                                                                                  | A1426.3 Analyze the DC and transient characteristics of CMOS logic gates.                                             |
|                                                                                                                                  | A1426.4 Build logic circuits using transmission gate logic.                                                           |
|                                                                                                                                  | A1426.5 Make use of charge leakage and charge sharing concepts to design dynamic logic circuits.                      |
| 3.                                                                                                                               | <b>A1427 Microprocessors and Microcontrollers</b>                                                                     |
|                                                                                                                                  | A1427.1 Analyze 8086 microprocessor and MSP430 microcontroller architectures.                                         |
|                                                                                                                                  | A1427.2 Develop programs using 8086 microprocessor and MSP430 microcontroller.                                        |
|                                                                                                                                  | A1427.3 Make use of peripherals of MSP430 to interface I/O devices.                                                   |
|                                                                                                                                  | A1427.4 Apply serial communication protocols for interfacing serial devices.                                          |
|                                                                                                                                  | A1427.5 Design embedded applications using MSP430 microcontroller.                                                    |
| 4.                                                                                                                               | <b>Professional Elective – 2</b>                                                                                      |
|                                                                                                                                  | <b>A1455 Microwave Engineering</b>                                                                                    |
|                                                                                                                                  | A1455.1 Analyze rectangular waveguide transmission line characteristics using concepts of Electromagnetic theory.     |
|                                                                                                                                  | A1455.2 Evaluate relation between input(s) and output(s) of microwave passive components using scattering parameters. |
|                                                                                                                                  | A1455.3 Compare performance of O-type and M-type microwave tubes.                                                     |
|                                                                                                                                  | A1455.4 Sketch the characteristics of microwave solid state devices.                                                  |
|                                                                                                                                  | A1455.5 Measure microwave parameters using microwave bench setup.                                                     |
|                                                                                                                                  | <b>A1458 Real Time Operating Systems</b>                                                                              |
|                                                                                                                                  | A1458.1 Compare and contrast a real time operating system with other operating system.                                |
|                                                                                                                                  | A1458.2 Design the applications to run in parallel either using processes or threads.                                 |
|                                                                                                                                  | A1458.3 Develop a practical real time system by using optimal core elements.                                          |
| A1458.4 Analyze the scheduling schemes for packet switching networks and protocols for the broadcast networks.                   |                                                                                                                       |
| A1458.5 Test for the performance analysis of different real time systems.                                                        |                                                                                                                       |
| 5.                                                                                                                               | <b>Professional Elective – 3</b>                                                                                      |
|                                                                                                                                  | <b>A1459 Radar Engineering</b>                                                                                        |
|                                                                                                                                  | A1459.1 Distinguish various radar systems and trackers based on characteristics and applications.                     |
|                                                                                                                                  | A1459.2 Derive modified radar range equation and characteristics equation of Matched Filter.                          |
|                                                                                                                                  | A1459.3 Derive range, relative velocity and angle error for different radars.                                         |
|                                                                                                                                  | A1459.4 Analyze the functionality of various elements of the radar receiver.                                          |
|                                                                                                                                  | <b>A1462 Embedded Hardware and Software Co-Design</b>                                                                 |
| A1462.1 Apply techniques for the concurrent design or co-design of embedded systems that are dedicated to specific applications. |                                                                                                                       |

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|            | <p>A1462.2 Apply hardware and software design techniques for construction of embedded systems.</p> <p>A1462.3 Distinguish various target architectures based on architecture specialization techniques.</p> <p>A1462.4 Discuss modern design methodologies with an emphasis on early design phases, including modeling, verification and system-level synthesis.</p>                                                                                                                                                                                                                                                                                                                                   |
| <b>6.</b>  | <p><b>A1539 JAVA Programming Laboratory</b></p> <p>A1539.1 Apply of data types, variables and control structures to solve problems</p> <p>A1539.2 Apply object-oriented concepts to solve problems including generating series primes, searching a pattern in a file.</p> <p>A1539.3 Design, write, debug and execute applet programs using Integrated Development Environment.</p> <p>A1539.4 Develop programs using threads and swing concepts.</p> <p>A1539.5 Apply I/O stream and networking classes to develop client and server interaction.</p> <p>A1539.6 Apply the concepts and create solution effectively as a member or leader in a team during the development of a software project.</p> |
| <b>7.</b>  | <p><b>A1428 CMOS VLSI Design Laboratory</b></p> <p>A1428.1 Construct the schematics and symbols of logic circuits using EDA tool.</p> <p>A1428.2 Analyze the characteristics of CMOS logic circuits using suitable simulator.</p> <p>A1428.3 Construct the layouts for complex CMOS logic circuits following DRC and ERC rules.</p> <p>A1428.4 Analyze VLSI circuit timing to estimate and compute the leakage power consumption of a VLSI circuit.</p> <p>A1428.5 Evaluate the performance of CMOS logic circuits in terms of power, speed and area.</p>                                                                                                                                              |
| <b>8.</b>  | <p><b>A1429 Microprocessors and Microcontrollers Laboratory</b></p> <p>A1429.1 Develop assembly language programs using EMU8086 emulator.</p> <p>A1429.2 Execute 8086 ALPs for arithmetic, logical, string, call operations.</p> <p>A1429.3 Build programs of MSP430 using embedded C.</p> <p>A1429.4 Interface LEDs, push buttons, potentiometer to MSP430.</p> <p>A1429.5 Test and debug 8086 ALPs and MSP430 embedded C programs.</p>                                                                                                                                                                                                                                                               |
| <b>9.</b>  | <p><b>A1430 Comprehensive Assessment – II</b></p> <p>A1015.1 Apply human values and ethics in professional life.</p> <p>A1015.2 Develop the moral ideals to maintain good relationships with people.</p> <p>A1015.3 Solve environmental related problems by keeping health of human being into consideration.</p> <p>A1015.4 Make use of the fundamental rights and human rights in life for individual dignity.</p> <p>A1015.5 Build the sound health system both physically and mentally by practicing yoga, karate, sports etc.</p>                                                                                                                                                                 |
| <b>10.</b> | <p><b>A1015 Human Values and Professional Ethics</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |



**COURSE OUTCOMES-R18 REGULATION**

**VII**

| S.NO | Course Outcomes (COs)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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| 1.   | <b>A1431 Embedded Systems</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|      | A1431.1 Analyze the embedded systems features and architecture considerations<br>A1431.2 Develop Programs using TM4C123GH6PM Microcontroller<br>A1431.3 Make use of Peripherals of TM4C123GH6PM to interface I/O Devices<br>A1431.4 Apply Serial Communication Protocols for interfacing serial Devices.<br>A1431.5 Design Embedded Applications using TM4C123GH6PM Controller                                                                                                                                                                                                                                                                                 |
| 2.   | <b>A1432 Wireless Communication Systems</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|      | A1432.1 Compare various wireless communication systems.<br>A1432.2 Analyze different wireless local area networks and personal area networks.<br>A1432.3 Design different parameters of cellular system.<br>A1432.4 Identify the appropriate multiple accessing technique for wirelesscommunication.<br>A1432.5 Develop the wireless networks.                                                                                                                                                                                                                                                                                                                 |
| 3.   | <b>A1433 Digital Image Processing</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|      | A1433.1 Demonstrate different operations on image pixels.<br>A1433.2 Distinguish between different types of image transforms.<br>A1433.3 Compare different image enhancement techniques.<br>A1433.4 Apply different techniques to perform image segmentation.<br>A1433.5 Contrast between different color models and compression techniques.                                                                                                                                                                                                                                                                                                                   |
| 4.   | <b>Professional Elective – 4</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|      | <b>A1463 Cellular and Mobile Communications</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|      | A1463.1 Analyze the cellular mobile system design concepts to improve the signal to noise ratio and cell coverage.<br>A1463.2 Interpret the Co-channel interferences and their parameters to improve the system capacity.<br>A1463.3 Illustrate the importance of cell coverage for signal and traffic, diversity techniques and mobile antennas to a caller.<br>A1463.4 Utilize the Omni directional and directional antennas to improve the channel capacity and interference reduction.<br>A1463.5 Demonstrate the Interim Standard, Digital Enhanced Cordless System, multiple access schemes of the wireless networks and standards and types of handoff. |
|      | <b>A1465 Low Power VLSI Design</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|      | A1465.1 Comprehend different sources of power dissipation.<br>A1465.2 Realize switched capacitance and arrive at ways to minimize.<br>A1465.3 Analyze and minimize dynamic and static power consumption in VLSI circuits. A1465.4 Outline the working principles of adiabatic logic.<br>A1465.5 Establish ways to minimize power in software design.                                                                                                                                                                                                                                                                                                           |
| 5.   | <b>A1466 Development of Secure Embedded Systems</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|      | A1466.1 Analyze the embedded systems security concepts.<br>A1466.2 Utilize the systems software considerations for embedded security.<br>A1466.3 Make use of Development Tool Security to secure embedded software development.<br>A1466.4 Apply Cryptographic concepts for embedded systems security.<br>A1466.5 Analyze the data protection protocols.                                                                                                                                                                                                                                                                                                       |
|      | <b>Open Elective – 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|      | <b>A1582 Fundamentals of DBMS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |

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|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|           | <p>A1582.1 Apply suitable data models for given application.</p> <p>A1582.2 Design database using integrity constraints and ACID properties.</p> <p>A1582.3 Construct optimized SQL queries to solve real time problems.</p> <p>A1582.4 Apply suitable normal form to eliminate data redundancy.</p> <p>A1582.5 Choose appropriate index structure to improve performance.</p>                                                             |
| <b>6.</b> | <p><b>A1434 Embedded Systems Laboratory</b></p> <p>A1434.1 Build Embedded C Programs using TM4C123GH6PM microcontroller.</p> <p>A1434.2 Execute TM4C123GH6PM Programs using Code Composer Studio.</p> <p>A1434.3 Interface LEDs, Push Buttons, Potentiometer to TM4C123GH6PM.</p> <p>A1434.4 Test and Debug TM4C123GH6PM Programs using Code Composer Studio.</p> <p>A1434.5 Develop embedded systems applications using TM4C123GH6PM.</p> |
| <b>7.</b> | <p><b>A1435 Signal and Image Processing Laboratory</b></p> <p>A1435.1 Compile programs to perform DFT, IDFT and FFT a given sequence.</p> <p>A1435.2 Design different filters in discrete time domain.</p> <p>A1435.3 Perform different operations on images using MATLAB.</p> <p>A1435.4 Analyze the histogram of given images.</p>                                                                                                       |
| <b>8.</b> | <b>A1436 Mini-Project/Internship</b>                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>9.</b> | <b>A1437 Project Work Phase – I</b>                                                                                                                                                                                                                                                                                                                                                                                                        |

## COURSE OUTCOMES-R18 REGULATION

### VIII

| S.NO      | Course Outcomes (COs)                                                                             |
|-----------|---------------------------------------------------------------------------------------------------|
|           | <b>MOOCs Course/ Professional Elective – 5</b>                                                    |
|           | <b>A1467 Satellite Communications</b>                                                             |
|           | A1467.1 Analyze the functionality of various elements of satellite communication system.          |
|           | A1467.2 Apply launching procedures and Ephemeris data to place and locate satellite in the orbit. |
|           | A1467.3 Create link budgets to meet specific objectives for C/N.                                  |
|           | A1467.4 Analyze the various GNSS constellations used for navigation.                              |
| <b>1.</b> | A1467.5 Differentiate various access techniques used for communication.                           |
|           | <b>A1470 Embedded System Design</b>                                                               |
|           | A1470.1 Analyze the embedded systems components and microcontroller selection.                    |
|           | A1470.2 Distinguish interrupts in terms of their functions and applications.                      |
|           | A1470.3 Make use of memory addressing concepts to embedded system design.                         |
|           | A1470.4 Apply system boot concepts for embedded systems design.                                   |
|           | A1470.5 Differentiate debouncing techniques and switch types.                                     |
|           | <b>Open Elective – 3</b>                                                                          |
|           | <b>A1583 Basics of Software Engineering</b>                                                       |
|           | A1583.1 Apply the phases of software development life cycle in application development.           |
| <b>2.</b> | A1583.2 Identify software requirements for construction.                                          |
|           | A1583.3 Design requirement engineering process for change management.                             |
|           | A1583.4 Apply the design concepts for design models.                                              |
|           | A1583.5 Construct the various testing techniques for software systems.                            |
| <b>3.</b> | <b>A1438 Technical Seminar</b>                                                                    |
| <b>4.</b> | <b>A1439 Project Work Phase – II</b>                                                              |