SIR C R REDDY COLLEGE OF ENGINEERING, ELURU
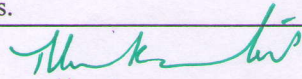## Approved by AICTE & Affiliated to JNTUK, Kakinada
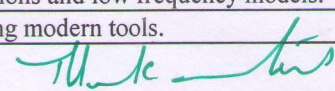## DEPARTMENT OF ECE
COURSE OUTCOMES 2020-2024

CODE	COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
R201101	Mathematics –I	CO1	Examine the convergence of series and apply mean value theorem to real life problem.
		CO2	Solve the Differential Equations of first and higher order related to various engineering applications.
		CO3	Apply the partial differentiation technique to solve physical problem
		CO4	Apply double and triple integrals to find areas and volumes.
R201102	Communicative English	CO1	Apply the four language learning skills-listening, speaking, reading, writing (LSRW)
		CO2	Employ knowledge of grammatical structures and vocabulary in speech and writing
		CO3	Apply effective communication skills for professional possibilities.
		CO4	Develop acceptable personality traits suitable for chosen profession.
R201104	Engineering Drawing	CO1	Construct polygons, scales and draw curves used in engineering applications
		CO2	Apply concept of orthographic projection to project points and lines inclined to both reference planes.
		CO3	Apply concept of orthographic projections of planes inclined to both the reference planes.
		CO4	Apply concept of orthographic projections of solids inclined to both the reference planes.
		CO5	Draw isometric view of objects from orthographic views and vice versa
R201106	English Communication Skills Lab	CO1	Recognize the sounds of English with the help of audio visual aids
		CO2	Build confidence and overcome inhibitions while speaking in English.
		CO3	Demonstrate acquired language skills in performing the designated activity.
R201110	Prog. for Problem Solving Using C	CO1	Apply the basic concepts of C Programming for problem-solving and different number systems.
		CO2	To use different operators, write programs that use control statements for a given problem.
		CO3	Illustrate the concepts of Homogeneous and heterogeneous data types, pointers and file system for solving mathematical and engineering problems.
		CO4	Decompose a given problem into functions and to develop modular reusable code.
R201113	Prog. for Problem Solving Using C LAB	CO1	Describe the basics of computer and understand the problem-solving aspect.
		CO2	Design and develop C program to evaluate simple expressions and logical operations.
		CO3	Develop & Implement C programs with suitable modules to solve the given problem.
		CO4	Demonstrate the concept of pointer and perform I/O operations in files.
R201115	Applied Chemistry	CO1	Identify the advantages and limitations of Plastic materials, Elastomers and their use in day to day life.
		CO2	Select the suitable methods of corrosion control and gain the knowledge of applications of
		CO3	Recognize the need of nano materials, liquid crystals, semiconductors and super conductors.
		CO4	Gain the knowledge of applications of different analytical instruments and generation of electricity from various Non-Conventional energy sources.
		CO5	Obtain the knowledge of computational chemistry and molecular machines.
R201116	Applied Chemistry Lab	CO1	Obtain the knowledge of acid-base titrations to determine the strength of acid and base solutions.
		CO2	Gain the knowledge of Redox titrations to determine the concentration of samples such as Ores, $KMnO_4$ and Copper using different indicators.
		CO3	Obtain the knowledge of complexometry titrations to determine the hardness of given water sample by EDTA method.
		CO4	Gain the knowledge of commonly used instruments such as pH meter, Conductivity meter and Potentiometer to determine the strength of given acid solutions.
R201201	Mathematics –II	CO1	Solve system of linear algebraic equations and apply eigen value computation technics to reduce a given quadratic to canonical form
		CO2	Solve algebraic and Transcendental equations by using Numerical methods
		CO3	Apply Newton 's forward and backward interpolation and Lagrange's formula for equal and unequal intervals.
		CO4	Compute numerical solutions of differential equations.

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R201207	Applied Physics	CO1	Apply the knowledge of different optical phenomena in daily life.
		CO2	Distinguish between laser sources and conventional sources and study the propagation of light through optical fibres.
		CO3	Explain fundamental concepts of quantum mechanics and analyze the behaviour of electron in metals according to various theories
		CO4	Summarize magnetic & dielectric material properties and recognize their need in engineering applications.
		CO5	Understand electrons & holes behaviour in semiconductors and extraordinary behaviour of materials at various transition temperatures
R201212	OOPS	CO1	Show competence in the use of the Java Programming language in the development of small to medium sized application programs that demonstrate professionally acceptable coding and performed standard
		CO2	Illustrate the basic principles of the object-oriented programming
		CO3	Develop exception handling and Multi threading with applications
		CO4	Design and Event handling in Gui applications and develop Networking applications
		CO5	Show competence in the use of the Java Programming language in the development of small to medium sized application programs that demonstrate professionally acceptable coding and performed standard
R201213	Network Analysis	CO1	To Define basic Electrical Quantities and associated units and relationship between charge, current, voltage and power.
		CO2	Discuss about what is active elements, passive elements and identification of mesh, node,path,loop.
		CO3	Analyze the dc excitations for RL,RC,RLC circuits
		CO4	To analyze the concepts of network theorems for DC and AC and its application in
		CO5	Calculate the two port network parameters (Z, Y, ABCD, h & g).
R201214	Basic Electrical Engineering	CO1	Able to explain the operation of DC generator and analyze the characteristics of DC generator.
		CO2	Able to explain the principle of operation of DC motor and analyze their characteristics. Acquire the skills to analyze the starting and speed control methods of DC motors.
		CO3	Ability to analyze the performance and speed – torque characteristics of a 3-phase induction motor and understand starting methods of 3-phaseinduction motor.
		CO4	Able to explain the operation of Synchronous Machines
		CO5	Capability to understand the operation of various special machines.
R201233	Applied Physics Lab	CO1	Apply the knowledge of different phenomena of light like interference, diffraction and handle various optical measuring instruments.
		CO2	Analyze various electronic circuits and study the temperature dependence of
		CO3	Apply the knowledge of phenomena like LASER diffraction and measure the numerical aperture of an optical fibre
R201237	Electronic workshop Lab	CO1	Examine characterstics and performance of AC and DC components
		CO2	Analyze the behaviour of various measuring instruments.
		CO3	Describe the working of soldering and PCB layout
R201238	Basic Electrical Engineering Lab	CO1	Analyze characteristics & performance of DC shunt and series machines
		CO2	Analysing behaviour of 1-phase transformer at various loads and power factor conditions
		CO3	Analyze performance of 3- Φ induction motor and alternator
R2021011	Mathematics-III	CO1	Apply the concepts of vector calculus to the problems of workdone by a force,circulation and flux.
		CO2	Apply Laplace transforms to solve linear differential equations with constant coefficients.
		CO3	Compute Fourier series of the periodic functions and apply Fourier transform to a range of non-periodic functions.
		CO4	Solve the first and higher order Partial differential equations and apply to various engineering problems.
R2021041	Electronic Devices and Circuits	CO1	Apply and acquire knowledge on basic concepts of semiconductor physics.
		CO2	Apply the concept of different PN junction diodes in electronic circuits.
		CO3	Analyze various components of power supplies and transistor biasing.
		CO4	Design transistor amplifiers in various configurations and low frequency models.
		CO5	Implement various applications of transistors using modern tools.

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R2021042	Switching Theory and Logic Design	CO1	Classify different number systems and apply to generate various codes.
		CO2	Use the concept of Boolean algebra in minimization of switching functions
		CO3	Design different types of combinational logic circuits.
		CO4	Apply knowledge of flip-flops in designing of Registers and counters
		CO5	The operation and design methodology for synchronous sequential circuits and algorithmic state machines.
R2021043	Signals and Systems	CO1	Differentiate the various classifications of signals & systems
		CO2	Analyze the frequency domain representation of signals using Fourier concepts
		CO3	Classify the systems based on their properties and determine the response of LTI systems
		CO4	Know the sampling process and various types of sampling techniques
		CO5	Apply Laplace & Z transforms to analyze signals and systems
R2021044	RVSP	CO1	Understand the concepts of Random variables and its operations
		CO2	Analyze the operations like expectation, variance and moments of multiple random variables
		CO3	Characterize the random processes in time and frequency domain
		CO4	Analyze LTI systems driven by a stationary random process using correlation and spectral density functions.
R2021045	OOPS through Java Lab	CO1	Identify classes, objects, members of a class and the relationship amon them needed for a specific problem
		CO2	Implement programs to distinguish different forms of inheritance
		CO3	Create packages and to reuse them
		CO4	Develop programs using Exception Handling mechanism
		CO5	Develop multithreaded application using synchronization concept.
		CO6	Design GUI based applications using Swings and AWT
R2021046	EDC LAB	CO1	Identify various electronic components and devices with their specifications.
		CO2	Analyze the characteristics of various junction diodes and transistors and calculate their parameters.
		CO3	Verify the parameters of rectifier circuits with and without filter and voltage regulator.
		CO4	Design various amplifiers and observe its frequency response
R2021047	STLD LAB	CO1	Realize and implementation of Boolean function using digital IC's
		CO2	Implementaion of diffrent Combinational logic circuits using IC's
		CO3	Realize and implementation of synchronous and asynchronous cunters using flip-flop IC's
		CO4	Design a Finite state mechine for Sequence detector
R2021048	Python programming lab	CO1	Know comprehensions,generators in python
		CO2	Know exception handling in python
		CO3	Know file I/O
		CO4	Understand various data types like lists,tuples,strings etc
		CO5	Know usage of various pre-defined functions on the above data types
R2022041	Electronic Circuit Analysis	CO1	Design and analysis of small signal high frequency transistor amplifier using BJT and FET.
		CO2	Design and analysis of multi stage amplifiers using BJT and FET and Differential amplifier using BJT
		CO3	Deduce the expressions for frequency of oscillation and condition for oscillation of RC and LC oscillators and their amplitude and frequency stability concept.
		CO4	Know the classification of the power and tuned amplifiers and their analysis with performance comparison
R2022042	Digital IC Design	CO1	Learn the Hardware Description Language (VHDL & VERILOG).
		CO2	Understand the structure of commercially available digital integrated circuit families.
		CO3	Analyze and design combinatorial and sequential logic circuits using HDL code.
		CO4	Interpret the digital logic circuits using MOS logic circuits.
R2022043	Analog Communications	CO1	Students will be able to Differentiate various Analog modulation and demodulation schemes
		CO2	Spectral characteristics Analyze noise characteristics of various analog modulation methods
		CO3	Analyze various functional blocks of radio transmitters and receivers
		CO4	Design simple analog systems for various modulation techniques·

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R2022044	Linear control Systems	CO1	Apply the concepts of feedback and obtain transfer function for various control systems.
		CO2	Identifying the performance metrics of the control system in time domain and frequency domain.
		CO3	Control systems for various applications can be analyzed in time and frequency domain.
		CO4	Analyze control systems using compensation techniques and state space approach.
R2022045	Management and Organizational Behavior	CO1	After completion of the Course the student will acquire the knowledge on management functions, global leadership and organizational structure.
		CO2	Will familiarize with the concepts of functional management that is HRM and Marketing of new product developments.
		CO3	The learner is able to think in strategically through contemporary management practices.
		CO4	The learner can develop positive attitude through personality development and can equip with motivational theories.
		CO5	The student can attain the group performance and grievance handling in managing the Organizational culture.
R2022046	ECA LAB	CO1	Calculate various parameters of fT using modern tools
		CO2	Analyze the working of various oscillators
		CO3	Analyze the working of various amplifiers.
		CO4	Simulate various amplifiers and oscillators using modern tools
R2022047	AC LAB	CO1	Analyze and compare different analog modulation schemes for their modulation factor and power
		CO2	Study pulse amplitude modulation.
		CO3	Characterize different analog modulation schemes and can compute the error performance.
		CO4	Define and simulate the Analog modulations and demodulations .
R2022048	DICD LAB	CO1	verify the functionality logic gates using VHDL
		CO2	Design and verify various combinations logic circuits using VHDL
		CO3	Design and verify various sequential logic circuits using VHDL
		CO4	Implement Mac and ALU using VHDL
R202204A	SOFT SKILLS LAB	CO1	Apply the four languages learning skills-listening, speaking, writing (LSW) for professional success.
		CO2	Employ knowledge of vocabulary in speech and writing
		CO3	Apply effective communication skills in cross cultural context to enhance professional possibilities.
		CO4	Develop acceptable personality traits suitable for chosen profession.
R2031041	Analog ICs and Applications	CO1	Understand the operational amplifier (IC 741) and its characteristics
		CO2	Design circuits using operational amplifier for various applications
		CO3	Analyze and design active filters using operational amplifier
		CO4	Classify various types of Analog to digital, digital to analog converters and their specifications
R2031042	Electromagnetic Waves and Transmission Lines	CO1	Derive and Calculate the expressions for input impedance of transmission lines, reflection coefficient, VSWR etc. using smith chart
		CO2	Determine E and H using various laws and applications of electric & magnetic fields
		CO3	Apply the Maxwell equations to analyse the time varying behaviour of EM waves
		CO4	Gain the knowledge in uniform plane wave concept and characteristics of uniform plane wave in various media
		CO5	Calculate Brewster angle, critical angle and total internal reflection
R2031043	Digital Communications	CO1	Understand basic components of digital communication systems
		CO2	Design Optimum receivers for digital modulation techniques
		CO3	Analyze the error performance of digital modulation techniques
		CO4	Know about different error detecting and error correcting codes.
R203105H	DBMS	CO1	Understand the dbms concepts and its architecture
		CO2	Create Relational Models by using SQL Constraints
		CO3	Design E-R Diagrams and E-R Mapping to Relation Model.
		CO4	Apply SQL Queries for Database Management
		CO5	Apply Normalization Techniques for schema Refinement

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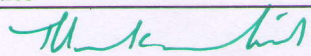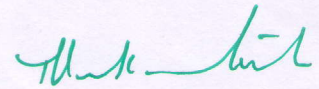Sir C.R.R.College of Engineering
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CODE	COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
R203104C	CAO	CO1	Analyze the architecture of modern computer and performance of a computer using performance equation
		CO2	Classify different instruction types and calculates the effective address of an operand by addressing modes
		CO3	Illustrate the operation and interface of different I/O devices and memory system
		CO4	Design and describe the execution of instructions using hardwired and micro programmed control units
R2031044	AICA LAB	CO1	Understand the basics of Op-Amp and to Design, Analyze Amplifiers, Active filters and Hysteresis voltage of Schmitt trigger using 741 IC.
		CO2	Understand the functionality of IC555 timer and design monostable and astable
		CO3	Understand the characteristics of PLL & design the various applications of PLL
		CO4	Understand the functionality of IC741design 4bit DACand oscillators
R2031045	DC LAB	CO1	Demonstrate the performance of Analog to Digital Conversion techniques.
		CO2	Analyze different Digital Modulation & Demodulation schemes
		CO3	Evaluate various Source & Channel Coding Techniques
		CO4	Analyze Multiplexing & Demultiplexing scheme
R2031046	Data Structures using Java Lab	CO1	Implementation of different operations stacks, queues and linked lists.
		CO2	Implementation of Binary search trees
		CO3	Implementation of Graph traversal techniques and minimum cost spanning tree techniques
		CO4	Implementation of Different Searching and Sorting techniques
R2032041	MPMC	CO1	Understand the architecture of 8086 microprocessor/ 8051 microcontroller and their operation.
		CO2	Demonstrate programming skills in assembly language for 8086 processor and 8051Controller
		CO3	Analyze various interfacing techniques and apply them for interfacing with 8086 processor / 8051 Controller
		CO4	Understand the architectural features of ARM Cortex M3 processor
R2032042	VLSI Design	CO1	Demonstrate a clear understanding of fabrication flow and technology scaling
		CO2	Apply the design rules and draw layout of a given logic circuit
		CO3	Analyse the behaviour of amplifier circuits with various loads
		CO4	Design static and dynamic CMOS based combinational and Sequential logic circuits
		CO5	Demonstrate a clear understanding of FPGA architectures and advanced technologies
R2032043	Digital Signal Processing	CO1	apply the difference equation concept in the analysis of discrete time systems
		CO2	use the FFT algorithm for sloving the DFT of a given signal
		CO3	design a digital filters from the given specifications
		CO4	realize the FIR and IIR structures from designed digital filters
		CO5	Apply the signal processing concepts on DSP Processors
R203204C	EMBEDDED SYS	CO1	Understand the basic concepts of an embedded system and able to know an embedded system design approach to perform a specific function.
		CO2	Associate with hardware components required for an embedded system and for the design approach of an embedded hardware.
		CO3	Make use of various embedded firmware design approaches, development languages on embedded environment.
		CO4	Understand how to integrate hardware and firmware of an embedded system using real time operating system.
		CO5	Analyse embedded software development cycles and tools including testing.
RR203205F	Python programming	CO1	Develop essential programming skills in computer programming concepts like data types, containers
		CO2	Apply the basics of programming in the python language
		CO3	Solve coding tasks related conditional execution,loops
		CO4	Solve coding tasks related to the fundamental notions and techniques used in object oriented programming

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R2032044	MPMC LAB	CO1	An ability to understand programming of processors/ microcontroller
		CO2	Develop assembly language programs for processors.
		CO3	Develop assembly language programs for various applications using 8051 microcontroller
		CO4	An ability to perform interfacing with 8086 and 8051.
R2032045	VLSI LAB	CO1	Perform simulation of various combinational logic circuits and sequential logic circuits using Verilog
		CO2	Perform FPGA level synthesis of various combinational logic circuits and sequential logic circuits using Verilog
		CO3	perform backend level design of combinational and sequential circuits
R2032046	DSP LAB	CO1	Understand the handling of discrete signals in time and frequency domain and using MATLAB
		CO2	Demonstrate various signal processing operations using MATLAB
		CO3	Analyze and Design IIR and FIR filters using MATLAB
		CO4	Verify various signal processing operations on DSP kit
R2032047	ARM based/ Aurdino based Programming	CO1	Comprehend Microcontroller-transducers interface techniques
		CO2	Establish serial communication link with Arduino
		CO3	Analyze basics of SPI interface
		CO4	Interface stepper motor with Arduino
		CO5	Analyze accelerometer interface techniques
R2032048	Research Methodology	CO1	Understand the fundamentals of research and research design
		CO2	Summarize the various literature review techniques and developing theoretical orientation and sampling methods
		CO3	Demonstrate knowledge and understanding of Data Collection , Analysis and interpretation methods
		CO4	Develop and Formulate the report writing steps
R204104B	Digital Image Processing	CO1	Perform image manipulations and different digital image processing techniques
		CO2	Perform basic operations like – Enhancement, segmentation, compression, Image transforms and restoration techniques on image.
		CO3	Analyze pseudo and full color image processing techniques.
		CO4	Apply various morphological operators on images
R204104D	Satellite Communication	CO1	Understand the concepts, applications and subsystems of Satellite communications
		CO2	Derive the expression for G/T ratio and to solve some analytical problems on satellite link design
		CO3	Understand the various types of multiple access techniques and architecture of earth station design
		CO4	Understand the concepts of GPS and its architecture
R204104F	DICD using CMOS	CO1	Understand the concepts of MOS Design
		CO2	Design and analysis of Combinational and Sequential MOS Circuits
		CO3	Extend the Digital IC Design to Different Applications
		CO4	Understand the Concepts of Semiconductor Memories, Flash Memory, RAM array organization
R204104G	Radar Engineering	CO1	Derive the radar range equation and to solve some analytical problems.
		CO2	Understand the different types of radars and its applications.
		CO3	Understand the concept of tracking and different tracking techniques.
		CO4	Understand the various components of radar receiver and its performance.
R204105T	IOT	CO1	Illustrate IoT architecture reference models for IoT/M2M systems
		CO2	Interpret communication technologies and web connectivity technologies in IoT environment
		CO3	Describe various business models relevant to IoT
		CO4	Outline different cloud technologies in IoT
		CO5	Identify sensor technologies for sensing real world entities

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CODE	COURSE	C.O CODE	COURSE OUTCOME DESCRIPTION
R204105Y	CNS	CO1	Understand the basic principles of cryptography.
		CO2	Apply the functionality of secret and public key cryptography.
		CO3	Apply various message authentication functions and secure algorithms.
		CO4	Understand the different levels of security and services.
R2041011	HSSE	CO1	To become more aware of themselves, and their surroundings (family, society, nature)
		CO2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind
		CO3	To have better critical ability.
		CO4	To become sensitive to their commitment towards what they have understood (human values, human relationship and human society.
		CO5	To apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.
R204104Z	Designer Tools	CO1	Identify the complex engineering problems relevant to the society and industry.
		CO2	Apply modern technologies, tools and systems in the field of Electronics and Communication Engineering to analyze the identified problem.
		CO3	Design and implement a viable solution to the problem
		CO4	Apply communication, report writing skills& Presentation skills.
R2042011	PROJECT	CO1	Identify the complex engineering problems relevant to the society and industry.
		CO2	Apply modern technologies, tools and systems in the field of Electronics and Communication Engineering to analyze the identified problem.
		CO3	Design and implement a viable solution to the problem
		CO4	Apply communication, report writing skills& Presentation skills.
		CO5	Develop the team work and leadership skills with professional and ethical values.