SRI VENKATESWARA COLLEGE OF ENGINEERING
Karakambadi Road, Opposite LIC Training Centre, Tirupati – 517 507.
Department of Electronics and Communication Engineering

S. No	COURSE NAME	COs	COURSE OUTCOMES
1	LINEAR ALGEBRA & CALCULUS (MA20ABS101)	C111.1	Solve the system of linear equations and reduce the quadratic forms to canonical form by applying matrices.
		C111.2	Apply mean value theorems to solve real valued functions
		C111.3	Familiarize with functions of several variables which is useful in optimization
		C111.4	Apply multiple integrals to find the area and volumes for different functions
		C111.5	Analyze the concepts of Beta and Gamma special function for different functions
2	APPLIED PHYSICS (PH20ABS103)	C112.1	Analyze the intensity variation of light due to Interference, diffraction and polarization.
		C112.2	Distinguish the types of lasers and apply its principles in modern technology.
		C112.3	Analyze the concept of dielectric and magnetic materials for potential applications in the emerging micro devices.
		C112.4	Apply the fundamentals of quantum mechanics and their applications to study the behaviour free electrons in solids.
		C112.5	Apply the basic concepts of semiconductor and superconductivity in Engineering applications.
3	COMMUNICATIVE ENGLISH (EG20AHS101)	C113.1	Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English. (L2)
		C113.2	Apply grammatical structures to formulate sentences and correct word forms. (L3)
		C113.3	Analyze discourse markers to speak clearly on a specific topic in informal discussions. (L4)
		C113.4	Evaluate reading/listening texts and to write summaries based on global comprehension of these texts. (L5)
		C113.5	Create a coherent paragraph interpreting a figure/graph/chart/table. (L6)
4	FUNDAMENTALS OF ELECTRICAL CIRCUITS (EE20AES103)	C114.1	Given a network, able to find equivalent impedance by using network reduction techniques and determine the current through any element and voltage across and power through any element. (L5)
		C114.2	Given a circuit and the excitation, determine the real power, reactive power, power factor etc, (L5)
		C114.3	Apply the network theorems suitably to analyze complex circuits and determine the effective voltages and currents in the circuit. (L6)
		C114.4	Determine the Dual of the Network, develop the Cut Set and Tie-set Matrices for a given Circuit. (L5)
		C114.5	Analyze the three-phase balanced and unbalanced circuits and to measure active and reactive powers in three phase circuits. (L5)
5	ENGINEERING DRAWING (ME20AES102)	C115.1	Draw basic geometrical constructions, curves used in engineering practices. (L1)
		C115.2	Understand the concept of projection and acquire visualization skills, projection of points, Lines and Planes. (L2)
		C115.3	Illustrate the projections of solids graphically. (L3)
		C115.4	Draw and explore the sectional views of right regular solids.(L3)
		C115.5	Draw the development of surfaces of solids. (L3)
6	ENGINEERING GRAPHICS LAB (ME20AES103)	C116.1	Draw the basic views related to projections of Lines, Planes. (L1)
		C116.2	Draw the basic views related to projections of Planes. (L1)
		C116.3	Illustrate orthographic views of simple objects. (L3)
		C116.4	Illustrate isometric projections of simple solids. (L3)
		C116.5	Interpret and comprehend with drafting packages for engineering practice. (L2)
		C117.1	Apply skill to find the wavelength of spectral lines using plane diffraction grating
		C117.2	Analyze the usage of dielectric materials applications.

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7	APPLIED PHYSICS LAB (PH20ABS104)	C117.3	Apply the concept of hysteresis curve of a ferromagnetic material to know the strength of magnetic material.
		C117.4	Analyze the working principles of semiconducting devices to study the applications of semiconducting technology.
		C117.5	Differentiate the patterns of spectrums using interference and diffraction phenomena.
8	COMMUNICATIVE ENGLISH LAB (EG20AHS101)	C118.1	Develop to handle and excel in a variety of self-instructional, learner-friendly modes of language learning. (L6)
		C118.2	Develop to employ better stress and intonation patterns and utter English sounds correctly. (L6)
		C118.3	Develop to avoid the impact of mother tongue in English and neutralize their accent. (L6)
		C118.4	Develop to participate with skill and confidence in Group Discussions, Interviews and Public Speaking. (L6)
		C118.5	Utilize the technical skills to prepare resume, report-writing, and formatmaking etc. (L3)
9	FUNDAMENTALS OF ELECTRICAL CIRCUITS LAB (EE20AES104)	C119.1	Distinguish analogy between electric and magnetic circuits and apply the principles to determine circuit parameters. (L5)
		C119.2	Remember, understand and apply various theorems and verify practically. (L5)
		C119.3	Understand and analyze active, reactive power measurements in three phase balanced & unbalanced circuit (L5)
10	LOGICAL SKILLS FOR PROFESSIONALS (MA20AMC102)	C11A.1	Demonstrate knowledge basic mathematics to develop analytical skills to solving problems of Averages - Percentages - Ratio. (L2)
		C11A.2	Demonstrate knowledge basic mathematics to develop analytical skills to solving problems of Partnership - Simple Interest and Compound Interest and time and distance. (L2)
		C11A.3	Demonstrate knowledge basic mathematics to develop analytical skills to solving problems of time ad work, problems on trains and Boats and streams. (L2)
		C11A.4	Analyze the techniques in series, coding and decoding and blood relations. (L3)
		C11A.5	Analyze the techniques in directions, problems on ages and analogy. (L3)
11	DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS (MA20ABS201)	C121.1	Solve the differential equations related to various engineering fields
		C121.2	Solve the linear differential equations of higher order related to various engineering fields
		C121.3	Identify solution methods for partial differential equations that model physical processes
		C121.4	Interpret the physical meaning of different operators such as gradient, curl and divergence
		C121.5	Estimate the work done against a field, circulation and flux using vector calculus
12	CHEMISTRY (CH20ABS103)	C122.1	Categorize the different problems present in the water and usage of technology to improve the quality of water.
		C122.2	Compare octahedral and tetrahedral complexes in crystal field theory and develop knowledge on super capacitors ,semi conductors, nanomaterials.
		C122.3	Apply the basic concepts of electro analytical techniques that facilitate rapid and reliable measurements
		C122.4	Distinguish polymerization reactions with mechanisms and their applications.
		C122.5	Use the principle of instrumentation to analyze the chemical and biological components.
13	PROBLEM SOLVING USING C (CS20AES101)	C123.1	Solve computational problems (L3).
		C123.2	Select the features of C language appropriate for solving a problem (L4)
		C123.3	Design computer programs for real world problems (L6)
		C123.4	Organize the data which is more appropriated for solving a problem (L6).
	ELECTRONIC	C124.1	Understand principle of operation, characteristics and applications of Semi conductor diodes, Bipolar Junction Transistor and MOSFETs.
		C124.2	Apply the basic principles for solving the problems related to Semiconductor diodes, BJTs, and MOSFETs.

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14	DEVICES AND CIRCUITS (EC20AES201)	C124.3	Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze biasing circuits of BJTs, and MOSFETs.
		C124.4	Design diode circuits and amplifiers using BJTs, and MOSFETs.
		C124.5	Compare the performance of various semiconductor devices.
15	ENGINEERING WORKSHOP (ME20AES101)	C125.1	Identify tools, work material, measuring instruments useful for domestic applications (L3).
		C125.2	Apply wood working skills in real world applications. (L3)
		C125.3	Build different parts with metal sheets in real world applications. (L3)
		C125.4	Apply fitting operations in various applications for good strength. (L3)
		C125.5	Analyze different types of basic electric circuit connections. (L4)
		C125.5	Demonstrate soldering and brazing in joining circuits. (L2)
		C125.6	Make moulds for sand casting using standard equipment. (L3)
		C125.7	Develop different weld joints for various metals. (L3)
		C125.8	Inspect various parts of machine components. (L4)
		C125.9	Make plastic components using proper raw material. (L3)
16	IT Workshop (CS20AES103)	C126.1	Identify the Internal parts of computers and Generation of Computers. (L1)
		C126.2	Assemble and disassemble a computer from its parts and prepare the computer ready to use.(L3)
		C126.3	Installation process of different types Operating system for a computer by their own.(L3)
		C126.4	Interconnect two or more computers for information sharing.(L4)
		C126.5	Access the Internet and browse it for required information.(L1)
		C126.6	Prepare the documents using Word Processor, prepare spread sheets for calculations using Excel, and documents for LaTeX.(L3)
		C126.7	Prepare slide presentation using the presentation tool.(L4)
17	PROBLEM SOLVING USING C LAB (CS20AES102)	C127.1	Build algorithm and flowchart for simple problems.
		C127.2	Use suitable control structures to solve problems.
		C127.3	Use suitable iterative statements, arrays and modular programming to solve the problems.
		C127.4	Implement Programs using pointers and String handling Functions.
		C127.5	Develop code for complex applications using structures, unions and file handling features.
18	CHEMISTRY LAB (CH20ABS104)	C128.1	Demonstrate electro-analytical techniques for the chemical analysis.
		C128.2	Apply Beer-Lambert Law to know the concentration of unknown samples
		C128.3	Analyze the quality and quantity of chemical compounds in given samples.
		C128.4	Prepare different types of polymers.
19	ELECTRONIC DEVICES & CIRCUITS LAB (EC20AES202)	C129.1	Understand the basic characteristics and applications of basic electronic devices. (L1)
		C129.2	Observe the characteristics of electronic devices by plotting graphs.(L2)
		C129.3	Analyze the Characteristics of UJT, BJT, MOSFET (L3).
		C129.4	Design MOSFET/ BJT based amplifiers for the given specifications. (L4)
		C129.5	Simulate all circuits in PSPICE/Multisim. (L5).

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20	ENVIRONMENTAL SCIENCE (CH20AMC201)	C12A.1	Understand the concepts of environment and natural resourses.
		C12A.2	Classify the types of ecosystems and conservation methods of bio-diversity
		C12A.3	Identify the causes and problems of pollution in their real life situations
		C12A.4	Develop awareness on social issues such as global warming, acid rains,ozone layer depletion and sustainalibility.
		C12A.5	Determine the consequences of population exploitation in detail.
21	SPEECH AND ORAL COMMUNICATION (EG20AMC103)	C12B.1	Improve the neutral accent and be free from mother tongue influence. (L6)
		C12B.2	Hypothesizing small talks on general topics and learn critiquing skills by participating in Conversations. (L6)
		C12B.3	Applying Vocabulary and using it in their day-to-day life. (L4)
		C12B.4	Understanding and mastering in verbal and non-verbal communication. (L2)
22	COMPLEX VARIABLES AND TRANSFORMS (MA20ABS302)	C211.1	Apply Cauchy-Riemann equations to find the analyticity of complex functions
		C211.2	Apply CauchY integral formula and Cauchy Integral theorem to evaluate improper integrals along contours
		C211.3	Analyze the concepts of Laplace Transforms to solve ordinary differential equations
		C211.4	Examine the Fourier series for different functions in half and full range
		C211.5	Analyze the concepts of Z transforms to solve Difference equations
		C211.6	Analyze the concepts of Z transforms to solve Difference equations.(L4)
23	DIGITAL LOGIC DESIGN (EC20APC301)	C212.1	Understand the properties of Boolean algebra, other logic operations, and minimization of Boolean functions using Karnaugh map.
		C212.2	Make use of the concepts to solve the problems related to the logic circuits.
		C212.3	Analyze the combinational and sequential logic circuits.
		C212.4	Compare various Programmable logic devices.
		C212.5	Compare the concepts of RAM and ROM.
		C212.6	Understand the operation CMOS, TTL logic families, ECL logic families and interfacing between them.
24	ELECTRONIC CIRCUIT ANALYSIS & DESIGN (EC20APC302)	C213.1	Understand the working principle of multistage amplifiers, Feedback amplifiers, power amplifiers and tuned amplifiers. (L2)
		C213.2	Analyze multistage amplifiers, feedback amplifiers, power amplifiers, and tuned amplifiers. (L4)
		C213.3	Design multistage amplifiers, feedback amplifiers, oscillators, power amplifiers and tuned amplifiers for the given specification.(L6)
		C213.4	Evaluate the efficiency of large signal (power) amplifiers. (L5)
		C213.5	Compare the frequency response of Single-stage, Double-stage amplifiers with Single tuned, double tuned and Stagger tuned amplifiers. (L2)
25	SIGNALS & SYSTEMS (EC20APC303)	C214.1	Understand the mathematical description and representation of continuous- time and discrete-time signals and systems. Also understand the concepts of various transform techniques. (L2)
		C214.2	Apply sampling theorem to convert continuous-time signals to discrete-time signals and reconstruct back, different transform techniques to solve signals and system related problems. (L3)
		C214.3	Analyze the frequency spectra of various continuous-time signals using different transform methods. (L4)
		C214.4	Analyze the systems based on their properties and determine the response of them. (L4)
		C214.5	Analyze the frequency spectra of various discrete-time signals using different transform methods. (L4)
26	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS (BA20AHS301)	C215.1	Should be able to understand managerial economics and demand analysis.
		C215.2	Should be able to analyze decisions relating to production and cost analysis.
		C215.3	Should be able to evaluate market structures and forms of business.
		C215.4	Should be able to assess financial statements and ratios

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		C215.5	Should be able to apply capital budgeting methods
27	**BASIC SIMULATION LAB (EC20APC304)**	**C216.1**	Learn how to use the MATLAB software and know syntax of MATLAB Programming (L1)
		C216.2	Understand how to simulate different types of signals and system response.(L2)
		C216.3	Analyze signals using Fourier, Laplace and Z-transforms. (L4)
		C216.4	Compute Fourier transform of a given signal and plot its magnitude and phase spectrum.(L2)
		C216.5	Verify Sampling theorem, Determine Convolution and Correlation between signals and sequences. (L5)
28	**(EC20APC305) DIGITAL LOGIC DESIGN LAB**	**C217.1**	Understand the pin configuration of various digital ICs used in the lab
		C217.2	Conduct the experiment and verify the properties of various logic circuits
		C217.3	Design sequential circuits
		C217.4	Design combinational circuits
29	**ELECTRONIC CIRCUIT ANALYSIS & DESIGN LAB (EC20APC306)**	**C218.1**	Understand the characteristics and frequency response of various amplifiers and determine its gain and bandwidth. (L2)
		C218.2	Simulate and analyze the performance of negative feedback amplifier circuits, oscillators and Power amplifiers and single tuned amplifiers. (L4)
		C218.3	Design a RC and LC oscillator circuits for a given frequency. (L2)
		C218.4	Calculate the efficiency of the power amplifier circuits. (L2)
		C218.5	Distinguish the operating modes of various Power amplifier circuits.(L6)
30	**(IT20ASC301)APPLICATION DEVELOPMENT USING PYTHON (Skill Course)**	**C219.1**	Write, Test and Debug Python Programs. (L1)
		C219.2	Use Conditionals and Loops for Python Programs. (L3)
		C219.3	Construct custom modules and functions to handle different operations. (L3)
		C219.4	Implement Object oriented concepts through real time scenarios and handle errors. (L3)
		C219.5	Design different shapes and objects using turtle graphics. (L4)
31	**(CH20AMC301) BIOLOGY FOR ENGINEERS**	**C21A.1**	Analyze about cells and their structure and function. Different types of cells and basics for classification of living Organisms
		C21A.2	Analyze about biomolecules, their structure and function and their role in the living organisms. How biomolecules are useful in Industry
		C21A.3	Analyze about human physiology
		C21A.4	Analyze about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms
		C21A.5	Apply biological Principles in different technologies for the production of medicines and Pharmaceutical molecules through transgenic microbes, plants and animals
32	**(MA20AMC301) LOGICAL SKILLS FOR PROFESSIONALS-II**	**C21B.1**	Demonstrate knowledge basic mathematics to develop analytical skills to solving problems of HCF, LCM Factors and Simplification
		C21B.2	Demonstrate knowledge basic mathematics to develop analytical skills to solving problems of Pipes, Alligation or Mixture
		C21B.3	Demonstrate knowledge basic mathematics to develop analytical skills to solving problems of Table, Bar Graphs and Pie Chart
		C21B.4	Analyze the techniques in Syllogism
		C21B.5	Analyze the techniques in Calender, Clocks and Number Series Analogyconcepts
33	**(EG20AMC301)Enhancing English Language Skills (Lateral Entry Students only)**	**C21C.1**	Use English language, both written and spoken, competently and correctly.
		C21C.2	Improve comprehension and fluency of speech.
		C21C.3	Hone the communication skills to meet the challenges of their careers successfully
		C21C.4	Gain confidence in using English in verbal situations
		C21C.5	Strengthen communication skills in different contexts like formal and informal

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34	(CS20AES401) DATA STRUCTURE S USING C	C221.1	Analyze the problems using asymptotic notations.
		C221.2	Apply Stack, Queues and linked list to solve different applications.
		C221.3	Demonstrate suitable sorting techniques for the real world problem
		C221.4	Implement tree structures in different patterns of representation of data.
		C221.5	Analyze the given problem using graph traversal techniques
35	(MA20ABS402) PROBABILITY THEORY AND STOCHASTIC PROCESSES	C222.1	Analyze and understand the concepts of Probability.
		C222.2	Analyze the concept of Single Random Variable and evaluate the operations that may be performed on a single Random variable
		C222.3	Analyze the concepts of Multiple Random Variable and evaluate the operations that may be performed on a multiple Random variable
		C222.4	Analyze the concepts of Random Process and evaluate the Temporal characteristics of Random Processes
		C222.5	Analyze the concepts of Random Process and evaluate the Temporal characteristics of Random Processes
36	(EC20APC401) ANALOG COMMUNICATIONS	C223.1	Understand the concepts of various Amplitude, Angle and Pulse Modulation schemes
		C223.2	Apply the concepts to solve problems in Analog and pulse modulation schemes
		C223.3	Analysis of Analog communication system in the presence of noise.
		C223.4	Compare and contrast design issues, advantages, disadvantages and limitations of various modulation schemes in Analog communication systems
		C223.5	Solve basic communication problems & calculate information rate and channel capacity of a discrete communication channel
37	(EC20APC402)ELECTROMAGNETIC WAVES AND TRANSMISSION LINES	C224.1	Understanding the basic laws and applications of electromagnetic fields
		C224.2	Evaluate the problems related to electromagnetic fields
		C224.3	Analyze Maxwell equations for static and time varying fields
		C224.4	Analyze electric and magnetic fields at the interface of different media
		C224.5	Evaluate electric and magnetic fields and calculates different angles
		C224.6	Evaluate transmission lines with equivalent circuit and their characteristics with various lengths
38	(EC20APC403) LINEAR & DIGITAL INTEGRATED CIRCUITS AND APPLICATIONS	C225.1	List out the characteristics of Linear and Digital ICs.
		C225.2	Discuss the various applications of linear & Digital ICs
		C225.3	Solve the application based problems related to linear and digital ICs
		C225.4	Analyze various applications based circuits of linear and digital ICs.
		C225.5	Design the circuits using either linear ICs or Digital ICs from the given specifications.
		C225.6	Develop digital circuits using HDL.
39	(EC20APC404) ANALOG COMMUNICATIONS LABORATORY	C226.1	Understand different analog modulation techniques &Radio receiver characteristics
		C226.2	Analyze different analog modulation techniques.
		C226.3	Design and implement different modulation and demodulation techniques
		C226.4	Observe the performance of system by plotting graphs & Measure radio receiver characteristics
		C226.5	Simulate all digital modulation and demodulation techniques
40	(CS20AES402) DATASTRUCTURES USING C LAB	C227.1	Demonstrate the concept of Recursion for solving a problem.
		C227.2	Choose and implement linear data structure to solve problems
		C227.3	Develop programs for searching and sorting algorithms

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		C227.4	Select and implement suitable non linear data structure for solving a problem
41	**(EC20APC405)LINEAR & DIGITAL INTEGRATED CIRCUITS AND APPLICATIONS LAB**	**C228.1**	Understand the pin configuration of each linear/ digital IC and its functional diagram.
		C228.2	Conduct the experiment and obtain the expected results.
		C228.3	Analyze the given circuit/designed circuit and verify the practical observations with the analyzed results.
		C228.4	Design the circuits for the given specifications using linear and digital ICs.
		C228.5	Acquaintance with lab equipment about the operation and its use.
42	**(EG20ASO401) SOFT SKILLS**	**C229.1**	Memorize various elements of effective communicative skills
		C229.2	Interpret people at the emotional level through emotional intelligence
		C229.3	Apply critical thinking skills in problem solving
		C229.4	Analyze the needs of an organization for team building
		C229.5	Judge the situation and take necessary decisions as a leader
		C229.6	Develop social and work-life skills as well as personal and emotional well being
43	**(SH20AMC401) NSS/Yoga/Cultural/Games and Sports/**	**C22A.1**	understanding of Asana with its benefits and contra-indications
		C22A.2	Understand the role and importance of Music and its cultural background
		C22A.3	Develop multicultural awareness and appreciation for Music and Drama by exposing learners to various forms of Art.
		C22A.4	Participate and contribute to society through various programmes of NSS, social services and community outreach programs
44	**(BA20AMC201) UNIVERSAL HUMAN VALUES**	**C22B.1**	Understanding the value of education to become more aware of themselves, and their surroundings (family, society, nature).
		C22B.2	Utilize the concepts of human being-harmony in myself become more responsible in life, and in handling problems with sustainable
		C22B.3	Understanding the concepts of society-harmony in human for better critical ability
		C22B.4	Understanding the human values, human relationship and human society to become sensitive to their commitment
		C22B.5	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
45	(MA20AMC401)Engineering Mathematics (Lateral Entry Students only)	**C22C.1**	Develop the use of matrix algebra techniques that is needed by engineers for practical applications
		C22C.2	Utilize mean value theorems to real life problems
		C22C.3	Solve the differential equations related to various engineering fields
		C22C.4	Apply multiple integrals to find the area and volumes for different functions
		C22C.5	Estimate the work done against a field, circulation and flux using vector calculus
46	**(EC20APC501) ANTENNAS AND WAVE PROPAGATION**	**C311.1**	Discuss various antenna parameters, principles of operation of basic antennas & Analyze field components of various dipole antennas
		C311.2	Demonstrate the basic principles of antennas which are operated in VHF- UHF frequency range.
		C311.3	Demonstrate the basic principles of antennas which are operated in Microwave frequency & discuss various feeding mechanism.
		C311.4	Analyze radiation pattern of various antenna arrays & Evaluate the antenna parameters.
		C311.5	Discuss various EM wave propagation methods & Analyze mathematical aspects of wave propagation.
47	**(EC20APC502) DIGITAL COMMUNICATIONS**	**C312.1**	Understand the elements of digital communication system, baseband pulse transmission, pass band digital modulation
		C312.2	Understand the concepts of geometric representation of signals, basics of information theory and error correcting codes
		C312.3	Apply the knowledge of signals and system & statistical theory to evaluate the performance of digital communication systems
		C312.4	Analyze the different coding, modulation techniques, Probability of error performance of digital system.

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		C312.5	Compare the performance of different modulation schemes& error correcting codes.
48	(EC20APC503) MICROPROCESSORS AND MICROCONTROLLERS	C313.1	Demonstrate ability to understand the architecture of 8086 microprocessor.
		C313.2	Demonstrate ability to develop 8086 assemble language programming using assembly language programming in MASM/TASM.
		C313.3	Demonstrate ability to describe interfacing of peripheral devices with 8086
		C313.4	Demonstrate ability to understand the architecture and addressing modes of 8051 microcontroller
		C313.5	Demonstrate ability to understand the hardware features of 8051 and interfacing with pushbutton switches, LED, LCD, Stepper motor, Seven Segment Display., etc.
49	(CS20AOE502) COMPUTER ARCHITECTURE & ORGANIZATION	C314.1	Understand the basics of instructions sets and their impact on processor design.
		C314.2	Demonstrate an understanding of the design of the functional units of a digital computer system.
		C314.3	Evaluate cost performance and design trade-offs in designing and Constructing a computer processor including memory.
		C314.4	Design a pipeline for consistent execution of instructions with minimum hazards
		C314.5	Recognize and manipulate representations of numbers stored in digital computers.
50	(EE20APE502) CONTROL SYSTEM ENGINEERING	C315.1	Understand the concepts of control systems classification, feedback effect, mathematical modelling, and and state space analysis. Apply the concepts of Block diagram reduction, Signal flow graph
		C315.2	Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.
		C315.3	Apply the concepts of RH and Root locus for stability calculations
		C315.4	Analyze system behavior of the system in frequency domain. frequency response characteristics, Design and develop different compensators. Bode, Nyquist, Polar plots for stability calculations
		C315.5	Analyze system behavior based on the state space analysis of that system. controllability and observability
51	(EC20APC504)DIGITAL COMMUNICATIONS LAB	C316.1	Understand real time behavior of different digital modulation schemes and technically visualize spectra of different digital modulation schemes.
		C316.2	Design and implement different modulation and demodulation techniques.
		C316.3	Analyze digital modulation & demodulation techniques
		C316.4	Simulate all digital modulation and demodulation techniques in MATLAB.
52	(EC20APC505)MICROPROCESSORS AND MICROCONTROLLERS LAB	C317.1	Demonstrate ability to handle arithmetic and Logical operations using assembly language programming in MASM/TASM.
		C317.2	Demonstrate ability to handle string instructions using assembly language programming in MASM/TASM.
		C317.3	Demonstrate ability to handle sorting operations and using assembly language programming in MASM/TASM
		C317.4	Demonstrate ability to handle Arithmetic and Logical operations using 8051 trainer kits.
		C317.5	Demonstrate ability to handle sorting operations using 8051 trainer kits.
		C317.6	To interface the Microprocessor/Microcontroller with various peripherals for various applications.
53	(EC20ASC501) PCB DESIGN AND PROTOTYPE DEVELOPMENT	C318.1	Learn how to design schematic and layout using PCB.
		C318.2	Design and implement experiments using PCB
		C318.3	Test and analyze the working of PCB.
		C318.4	Identify different components required in PCB Design.
		C318.5	Aware of PCB Making Process.
		C318.6	Able to design different circuits using design tools.
54	(BA20AMC501) CONSTITUTION OF INDIA	C319.1	Understand historical background of the constitution making and its importance for Building a democratic India
		C319.2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary
		C319.3	Understand the value of the fundamental rights and duties for becoming good citizen of India.

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		C319.4	Analyze the decentralization of power between central, state and local self-government
		C319.5	Apply the knowledge in strengthening of the constitutional institutions like CAG,Election Commission and UPSC for sustaining democracy.
55	(IT20AMC501) PROBLEM SOLVING AND PROGRAMMING	C31A.1	Solve computational problems (L3).
		C31A.2	Select the features of C language appropriate for solving a problem (L4)
		C31A.3	Design computer programs for real world problems (L6)
		C31A.4	Organize the data which is more appropriated for solving a problem (L6).
56	(EC20ATS501)Technical Seminar Presentation-I	C31B.1	Interpret the recent technological updations.
		C31B.2	Prepare Presentation and seminar report on the specified technical topic.
		C31B.3	Develop knowledge, presentation and communication skills.
		C31B.4	Defend or convince the audience during viva process.
57	(EC20AIP501)Evaluation of Summer Internship	C31C.1	**Identify** and grab the internship opportunity.
		C31C.2	**Develop** the skills required for doing the assigned project work.
		C31C.3	**Apply** the skills and use the modern tools for implementing the assigned project work.
		C31C.4	**Observe** the work environment and learn the work culture.
		C31C.5	**Develop** presentation and interpersonal communication skills through presentations and documentation.
58	(EC20APC601)DIGITAL SIGNAL PROCESSING	C321.1	Design & Implementation of IIR filters using different techniques
		C321.2	Design of FIR filters based on windowing methods
		C321.3	Analyze DFT computation using fast algorithms.
		C321.4	Analyse multi-rate signal processing techniques
		C321.5	Understanding the architecture details and instruction sets of fixed and Floating point DSP's
59	(EC20APC602) MICROWAVE ENGINEERING AND OPTICAL COMMUNICATION	C322.1	Analyze micro-wave circuits incorporating hollow, dielectric and planar waveguides, transmission lines, filters and other passive components, active devices.
		C322.2	Understand microwave transmission lines and how to Use microwave components such as isolators, Couplers, Circulators, Tees, Gyrators etc
		C322.3	Differentiate Linear bean tubes and crossed field tubes in terms of operation and performance
		C322.4	Understand various types of fibers, modes, configurations and signal degradations
		C322.5	Analyze signal degradation in optical fibers and compare the performance of various optical sources and detectors.
60	(EC20APC603) VLSI DESIGN	C323.1	Outline the processing steps in the fabrication of a nMOS, pMOS and CMOS structure.
		C323.2	Illustrate the Layout procedure of simple MOS circuit using Lambda based design
		C323.3	Summarize the scaling effects of various key parameters of MOSFET devices
		C323.4	Design various MOS based logic circuits.
		C323.5	Develop algorithms for automatic test generation for combinational and sequential circuits
61	(EC20APE601) ELECTRONIC MEASUREMENTS AND INSTRUMENTATION	C324.1	Describe the basic principles involved in the meters for measuring voltage, current, resistance and frequency (L2).
		C324.2	Analyze CRO for measuring signal characteristics (L4)
		C324.3	Analyze different waveforms using advanced instruments such as signal generators, logic analyzer & Spectrum analyzer (L4)
		C324.4	Apply the principles of various DC/AC bridges to solve various measurement parameters (L3)
		C324.5	Analyze various parameters using sensors and transducers (L4)

S. No	COURSE NAME	COs	COURSE OUTCOMES
62	(EE20AOE603) OPTIMIZATION TECHNIQUES THROUGH MATLAB	C325.1	Use optimization terminology and concepts, and understand how to classify an optimization problem
		C325.2	Apply optimization methods to engineering problems.
		C325.3	Implement optimization algorithms.
		C325.4	Compare different genetic algorithms.
		C325.5	Solve multivariable optimization problems.
63	(EC20APC604)DIGITAL SIGNAL PROCESSING LAB	C326.1	Implement various DSP Algorithms using software packages.
		C326.2	Implement DSP algorithms with Digital Signal Processor.
		C326.3	Analyze and observe magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.
		C326.4	Analyze & observe magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.
		C326.5	Analyze digital filters using Software Tools.
64	(EC20APC605) MICROWAVE AND OPTICAL COMMUNICATIONS LAB	C327.1	Understand the mode characteristics of Reflex Klystron oscillator and negative resistance characteristics of Gunn Oscillator.
		C327.2	Determine the Scattering matrix of given passive device experimentally and verify the same theoretically.
		C327.3	Determine numerical aperture and bending losses of a given optical fiber.
		C327.4	Establish optical link between transmitter and receiver experimentally to find attenuation and signal strength of the received signal.
65	(EC20APC606)VLSI DESIGN LAB	C328.1	Understand how to use FPGA/CPLD hardware tools in the lab.
		C328.2	Develop HDL source code for the given problem/experiment, and simulate the given circuit with suitable simulator and verify the results.
		C328.3	Analyze the obtained results of the given experiment/problem.
		C328.4	Design and implement the experiments using FPGA/CPLD hardware tools.
66	(EC20ASC601)GRAPHICAL SYSTEM DESIGN USING Lab VIEW	C329.1	Able to develop and edit functional block diagrams and front panels.
		C329.2	Able to utilize composite data in the form of Arrays and Clusters.
		C329.3	Able to control program execution through structures such as 'For-While' loops and 'Case Structures'
		C329.4	Able to utilize features which will reconfigure the general physical and software layouts of the LabVIEW programming environment
67	(BA20AMC502) INTELLECTUAL PROPERTY RIGHTS AND PATENTS	C32A.1	Understand IPR law & Cyber law
		C32A.2	Discuss registration process, maintenance and litigations associated with trademarks
		C32A.3	Illustrate the copy right law
		C32A.4	Enumerate the trade secret
68	(EC20ATS601)Technical Seminar Presentation-II	C32B.1	Interpret the recent technological updations.
		C32B.2	Prepare Presentation and seminar report on the specified technical topic.
		C32B.3	Develop knowledge, presentation and communication skills.
		C32B.4	Defend or convince the audience during viva process.
69	(AM20AMC601) AI TOOLS TECHNIQUES & APPLICATIONS	C32C.1	Demonstrate various AI applications, languages and Intelligent Agents.
		C32C.2	Solve problems using search strategies and understand the basic process of Machine Learning. CO3: Apply classification and regression algorithms on real world data.
		C32C.3	Develop an expert system.
		C32C.4	Comprehend the structure of an artificial neural network and identify the building blocks of a convolutional neural network.
		C411.1	**Apply** the boundary conditions of the rectangular, circular waveguides and cavity resonators to solve for field expressions in waveguides.

S. No	COURSE NAME	COs	COURSE OUTCOMES
70	Microwave Engineering and Optical Communications (19A04701T)	C411.2	**Analyze** different microwave passive devices and derive their scattering matrices.
		C411.3	**Differentiate** Linear beam tubes and cross field tubes in terms of operation and performance.
		C411.4	**Understand** various types of fibers, modes, configurations and signal degradations.
		C411.5	**Understand** the propagation and principle of operation of optical sources and detectors.
71	VLSI Design (19A04702T)	C412.1	**Understand** CMOS fabrication process, design rules and apply the concepts to draw the layout and stick diagrams of given logic circuits.
		C412.2	**Analyze** technology scaling, sheet resistance, capacitance and propagation delays in CMOS circuits.
		C412.3	**Analyze** the behaviour of MOSFET amplifier circuits with various loads.
		C412.4	**Design** MOSFET based logic circuits using various logic styles like static and dynamic CMOS.
		C412.5	**Analyze** the various design for testability methods for combinational & sequential CMOS Circuits.
72	Image Processing (19A04703d)	C413.1	**Analyze** various types of image fundamentals mathematically.
		C413.2	**Compare** image enhancement methods in spatial and frequency domains.
		C413.3	**Demonstrate** various segmentation algorithms for given image.
		C413.4	**Justify** DCT and wavelet transform techniques for image compression and standards.
		C413.5	**Describe** various color models for color image processing.
73	Cyber Security (19A05704b)	C414.1	**Summarize** the threats, vulnerabilities related to computer security
		C414.2	**Determine** the attacks on web data
		C414.3	**Analyze** the security tools and techniques for cloud computing
		C414.4	**Evaluate** the need for privacy and its impact on emerging technologies
		C414.5	**Categorize** the legal issues and ethical issues in computer society
74	Management Science (19A52701b)	C415.1	**Understand** the concepts & principles of management and designs of organization in a practical world
		C415.2	**Apply** the knowledge of Work-study principles & Quality Control techniques in industry
		C415.3	**Analyze** the concepts of HRM in Recruitment, Selection and Training & Development
		C415.4	**Evaluate** PERT/CPM Techniques for projects of an enterprise and estimate time, cost of project & to analyze the business through SWOT
		C415.5	**Create** Modern technology in management science.
75	Microwave and Optical Communications Lab (19A04701P)	C416.1	**Understand** the mode characteristics of Reflex Klystron oscillator and negative resistance characteristics of Gunn Oscillator.
		C416.2	**Determine** the VSWR and Impedance of an unknown load connected at the end of the bench setup.
		C416.3	**Determine** the Scattering matrix of given passive device experimentally and verify the same theoretically. Also determine numerical aperture and bending losses of a given optical fiber.
		C416.4	**Analyze** the radiation characteristics to find the directivity and HPBW of a given antenna.
		C416.5	**Establish** optical link between transmitter and receiver experimentally to find attenuation and signal strength of the received signal.
		C416.6	**Understand** the DC characteristics of LED and Photo diode.
76	VLSI Design Lab (19A04702P)	C417.1	**Develop** HDL source code for the given problem/experiment.
		C417.2	**Simulate** the given circuit with suitable simulator and analyze the results.
		C417.3	**Understand** how to use FPGA hardware tool and Cadence tool.
		C417.4	**Design** the circuit and implement using Cadence tool.
		C417.5	**Analyze** the waveforms and layout diagram.

S. No	COURSE NAME	COs	COURSE OUTCOMES
77	Industrial Training/Skill Development/Research Project (19A04705)	C418.1	**Identify** and grab the internship opportunity.
		C418.2	**Develop** the skills required for doing the assigned project work.
		C418.3	**Apply** the skills and use the modern tools for implementing the assigned project work.
		C418.4	**Observe** the work environment and learn the work culture.
		C418.5	**Develop** presentation and interpersonal communication skills through presentations and documentation.
78	Advanced 3G and 4G Wireless Mobile Communications (19A04801a)	C421.1	**Understand** the concepts of wireless communications and standards
		C421.2	**Apply** a wireless technique to solve engineering problem
		C421.3	**Analyze** working of wireless technologies
		C421.4	**Evaluate** a wireless technique in a given situation
		C421.5	**Plan** a wireless system for deployment
79	IoT Applications in Electrical Engineering (19A02802a)	C422.1	To get exposed to recent trends in few applications of IoT in Electrical Engineering
		C422.2	To understand about usage of various types of motionless sensors
		C422.3	To understand about usage of various types of motion detectors
		C422.4	To get exposed to various applications of IoT in smart grid
		C422.5	To get exposed to future working environment with Energy internet
80	Project (19A04803)	C423.1	**Identify** the socially relevant problems and define the problem statement.
		C423.2	**Analyze** and categorize executable project modules by applying acquired knowledge and skills with due consideration of constraints.
		C423.3	**Use** efficient resources/IT tools for designing project modules.
		C423.4	**Combine** all the modules through effective team work after efficient testing and simulation.
		C423.5	**Improve** the team building, communication and management skills.
		C423.6	**Elaborate** the completed task and demonstrate working of the model/module in most convincing manner.
		C423.7	**Compile** the project report with appropriate writing skills.
		C423.8	**Predict** the consequences of developed model in terms of safety, health hazards and ensure ethical values
		C423.9	**Verify** the scope of transforming model/module into marketable product through proper financial management.

HOD-ECE

SRI VENKATESWARA COLLEGE OF ENGINEERING
Karakambadi Road, Opposite LIC Training Centre, Tirupati – 517 507.
Department of Electronics and Communication Engineering

PROGRAMME OUTCOMES

PO1: Engineering Knowledge
An ability to apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems as appropriate to the field of electronics & communication engineering practice.

PO2: Problem Analysis
Ability to Identify, formulates, review research literature, and analyze complex Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design/development of solutions
Ability to Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems
Apply research-based knowledge and research methods including design of experiments, analysis and interpretation of data pertaining to Electronics & Communication Engineering problems and arrive valid conclusions.

PO5: Modern tool usage
An ability to use the techniques, resources and modern engineering tools necessary for modeling the complex system design in Electronics and Communication Engineering.

PO6: The engineer and society
Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability
An Ability to understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of need for sustainable development.

PO8: Ethics
Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work
Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication
Communicate effectively in both verbal and written forms such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance
Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member or a leader in a team, to manage projects in multidisciplinary environments.

PO12: Life-long learning
Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES

PSO1: An ability to get an employment in Electronics and Communication Engineering field and related industries and to participate & succeed in competitive examinations like GRE, GATE,TOEFL, PSUs, etc.

PSO2: Should be able to design and test various electronic systems that perform analog and digital processing functions.

HOD-ECE

SRI VENKATESWARA COLLEGE OF ENGINEERING

(AUTONOMOUS)
Department of INFORMATION TECHNOLOGY

PROGRAM OUTCOMES

- **ENGINEERING KNOWLEDGE:-** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **PROBLEM ANALYSIS:** - Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **DESIGN/DEVELOPMENT OF SOLUTIONS:** - Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **CONDUCT INVESTIGATIONS OF COMPLEX PROBLEMS:** - Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **MODERN TOOL USAGE:** - Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **THE ENGINEER AND SOCIETY:** - Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **ENVIRONMENT AND SUSTAINABILITY:** - Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **ETHICS:** - Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **INDIVIDUAL AND TEAM WORK:** - Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

- **COMMUNICATION:** - Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **PROJECT MANAGEMENT AND FINANCE:** - Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

Course Name	COs	COURSE OUTCOMES
Algebra & Calculus (19A54101)	**C111.1**	**Solve** the system of linear equations and reduce the quadratic forms to canonical form by applying matrices.
	C111.2	**Apply** mean value theorems for different functions with different intervals.
	C111.3	**Analyze** the multivariable calculus to find Jacobean, Maximum and Minimum.
	C111.4	**Demonstrate** multiple integrals to find the area and volume for different functions.
	C111.5	**Classify** the concepts of Beta and Gamma special functions for different functions.
Chemistry 19A51102T	**C112.1**	**Determine** the energy of the electron in a molecule as well as its geometry by using molecular orbital theory and Crystal field theory.
	C112.2	**Apply** the basic concepts of electro analytical techniques that facilitate rapid and reliable measurements.
	C112.3	**Distinguish** polymerization reactions with mechanisms and their applications.
	C112.4	**Use** the principle of instrumentation to analyze the chemical and biological components.
	C112.5	**Compare** the different molecular assemblies,molecular switches and molecular devices
Problem solving and Programming (19A05101T)	**C113.1**	**Evaluate** a computer-based system, process, components and Analyze problems by designing algorithms and flow chart
	C113.2	**Apply** logical skills to implement sloutions to slove computational problems
	C113.3	**Choose** appropriate control structure depending on the problem to be solved and divide complex problems into modules
	C113.4	**Apply** arrays to organize data to slove complex problems and effectively use memory with pointers
	C113.5	**Apply** structures to organize heterogenous data to slove real world problems and select appropriate

		sorting technique based on the problem type
Engineering Graphics Lab(19A03102)	**C114.1**	**Draw** various curves applied in engineering
	C114.2	**Show** projections of solids and sections graphically
	C114.3	**Draw** the development of surfaces of solids
	C114.4	**Use** computers as a drafting tool
	C114.5	**Draw** isometric and orthographic drawings using CAD packages.
Engineering Workshop(19A03101)	**C115.1**	Create and model different prototypes in the carpentry trade such as cross lap joint, dove tail joint.
	C115.2	Create and model various basic prototypes in the trade fitting such straight fit, V-fit
	C115.3	Create various basic prototypes in the trade of Tin smithy such as rectangular tray and open scoop.
	C115.4	Create various basic house wiring techniques such as connecting one lamp with one switch, connecting
	C115.5	two lamps with one switch, connecting a florescent tube, series wiring, godown wiring.
Chemistry Lab(19A51102P)	**C116.1**	Demonstrate electro-analytical techniques for the chemical analysis.
	C116.2	Apply Beer-Lambert Law to know the concentration of unknown samples.
	C116.3	Analyze the quality and quantity of chemical compounds in given samples.
	C116.4	Prepare different types of polymers.
Problem Solving and Programming Lab (19A05101P)	**C117.1**	**Develop** applications to slove the complex problems related to hardware and software
	C117.2	**Apply** problem solving techniques to find solutions to the problems
	C117.3	**Develop** the programs with modularity property
	C117.4	**Apply** logical skills to develop real world applications.
	C117.5	**Apply** searching and sorting techniques for solvingcomplex problems
Basic Electrical and Electronics Engineering(19A02201T)	**C118.1**	student must be able to apply mathematical logic to solve problems
	C118.2	student must be able to demonstrate basic electronic circuits with the working of different active components
	C118.3	Student must be able to Design circuits using passive and active components by using fundamental idea about basic electronics
	C118.4	Student must be able to analyze devices used in entertainment electronics
Probability and Statistics(19A54202)	**C121.1**	**Demonstrate** the concepts of Single Random Variable,Various distribution and density functions.
	C121.2	**Analyze** various parameters like mean, variance for Multiple Random variables.
	C121.3	**Analyze** Temporal & Spectral characteristics of Random Process and their properties.
	C121.4	**Assess** the Response of a Linear systems with Random Inputs
	C121.5	**Demontrate** the concepts of Noise, low pass filtered white noise, RC filtered noise.

Applied Physics(19A56101T)	**C122.1**	**Analyze** the phenomena of interference, diffraction and polarization and its applications
	C122.2	**Analyze** the significant properties and applications of both dielectric and magnetic materials in the emerging micro devices.
	C122.3	**Apply** the basic knowledge of electromagnetic waves and fiber optics to the engineering applications.
	C122.4	**Analyze** knowledge of semiconductors through the description and analysis of processes in various engineering applications.
	C122.5	**Apply** the fundamental aspects of Superconductivity and Nano technology to solve problems in our daily life.
Data Structures (19A05201T)	**C123.1**	**Analyze** algorithms to Evaluate efficiency using Asymptotic Notations and Compare different algorithms
	C123.2	**Apply** Arrays, linked lists, stacks and queues to design solutions to complex engineering problems
	C123.3	**Apply** trees for indexing and Compare different tree structures
	C123.4	**Apply** various graph traversal methods to applications,Design a minimum cost solution and hashing techniques in real world problems
	C123.5	**Organize** data in the form of Files and Apply sorting on large amount of data
Communicative English - I(19A52101T)	**C124.1**	To expose the students to variety of self instructional, learner friendly modes of language learning
	C124.2	To help the students cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.
	C124.3	To enable them to learn better pronunciation through stress, intonation and rhythm
	C124.4	To train them to use language effectively to face interviews, group discussions, public speaking
Information Technology Workshop(19A12201)	**C125.1**	**Student must be able to demonstrate disassemble and Assemble process of computer.**
	C125.2	Student must be able to analyze connections of different computers and network connectivity.
	C125.3	Student must be able to design slide presentations using the presentation tool.
	C125.4	Students are able to prepare a document using MS Office.
Communicative English - I Lab(19A52101P)	**C126.1**	To expose the students to variety of self instructional, learner friendly modes of language learning
	C126.2	To help the students cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc.
	C126.3	To enable them to learn better pronunciation through stress, intonation and rhythm

	C126.4	To train them to use language effectively to face interviews, group discussions, public speaking
Basic Electrical & Electronics Engineering Lab(19A02201P)	C127.1	Student must be able to understand different passive components used in electronic industry for common application
	C127.2	Student must be able to Design circuits using passive and active components for strengthening fundamental idea about basic electronics
	C127.3	Student must be able to understand basic construction of measuring instruments used in electronic measurements
	C127.4	Students are able to document the concepts implemented in the lab
Applied Physics Lab(19A56101P)	C128.1	**Apply** skill to find the wavelength of spectral lines using plane diffraction grating.
	C128.2	**Analyze** the usage of electrical and optical systems for various measurements.
	C128.3	**Apply** the concept of hysteresis curve of a ferromagnetic material to know the strength of magnetic material.
	C128.4	**Analyze** the working principles of semiconducting devices to study the applications of semiconducting technology.
	C128.5	**Differentiate** the patterns of spectrums using interference and diffraction phenomena.
Data Structures Lab (19A05201P)	C129.1	**Select** the data structure appropriate for solving the problem
	C129.2	**Implement** sorting and searching algorithms
	C129.3	**Implement** various data structures
	C129.4	**Illustrate** the working of stack and queue,linked list
	C129.5	**Organize** the data in the form of files
Mathematical Foundations of Computer Science(19A54303)	C211.1	Evaluate elementary mathematical arguments and identify fallacious reasoning
	C211.2	Understand the properties of Compatibility, Equivalence and Partial Ordering relations,Lattices and Hassee Diagrams
	C211.3	Design solutions for problems using breadth first and depth first search techniques
	C211.4	Solve the homogeneous and non-homogeneous recurrence relations
	C211.5	Apply the concepts of functions to identify the Isomorphic Graphs
Digital Logic Design(19A05301)	C212.1	Apply the basic knowledge of number systems, boolean algebra, logic gates and reduce boolean expressions using K-map
	C212.2	Design various Combinational circuits and analyze the operation of flipflops for implementing different logic functions
	C212.3	Analyze the operation of synchronous sequential circuits and design counters
	C212.4	Design combinational circuits & sequential circuits using PLD's (PAL,PLA,PROM)

	C212.5	Compare bipolar and MOS logic families
Design Thinking(19A99304)	C213.1	Generate and develop different design ideas.
	C213.2	Appreciate the innovation and benefits of design thinking.
	C213.3	Experience the design thinking process in IT and agile software development.
	C213.4	Understand design techniques related to variety of software services
Database Management Systems(19A05302T)	C214.1	Design a database for a real world information system
	C214.2	Define transactions which preserve the integrity of the database
	C214.3	Generate tables for a database
	C214.4	Organize the data to prevent redundancy
	C214.5	Pose queries to retrieve the information from database
Object Oriented Programming Through Java(19A05303T)	C215.1	To solve real world problems using OOP techniques.
	C215.2	To apply code reusability through inheritance, packages and interfaces
	C215.3	To develop applications by using parallel streams for better performance
	C215.4	To build GUIs and handle events generated by user interactions.
	C215.5	To use the JDBC API to access database
Design and Analysis of Algorithms(19A05402T)	C216.1	Determine the time complexity of an algorithm by solving the corresponding recurrence equation
	C216.2	Apply the Divide and Conquer strategy to solve searching, sorting and matrix multiplication problems.
	C216.3	Analyze the efficiency of Greedy and Dynamic Programming design techniques to solve the optimization problems.
	C216.4	Analyze the LC and FIFO branch and bound solutions for optimization problems, and compare the time complexities with Dynamic Programming techniques.
	C216.5	Define and Classify deterministic and Non-deterministic algorithms; P, NP, NP –hard and NP-complete classes of problems.
Database Management Systems Lab(19A05302P)	C217.1	Design database for any real world problem
	C217.2	Implement PL/SQL programs
	C217.3	Define SQL queries
	C217.4	Decide the constraints
	C217.5	Investigate for data inconsistency
Object Oriented Programming Through Java Lab(19A05303P)	C218.1	Recognize the Java programming environment.
	C218.2	Develop efficient programs using multithreading.

	C218.3	**Design reliable programs using Java exception handling features.**
	C218.4	**Extend the programming functionality supported by Java.**
	C218.5	**Select appropriate programming construct to solve a problem**
Design and Analysis of Algorithms Lab(19A05402P)	C219.1	nalyze a problem and design the solution for theproblem
	C219.2	implement efficient python programming for a specifiedapplication.
	C219.3	Students are able to analyze deterministic and non deterministic algorithms and interpret the insights of a problem.
	C219.4	apply the suitable algorithm for the given real worldproblem.
Biology For Engineers (19A99302)	C21A.1	Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms.
	C21A.2	Explain about biomolecules, their structure and function and their role in the living organisms. How biomolecules are useful in Industry
	C21A.3	Briefly about human physiology.
	C21A.4	Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms.
	C21A.5	Know about application of biological Principles in different technologies for the production of medicines and Pharmaceutical molecules through transgenic microbes, plants and animals.
Computer Organization(19A05401	C221.1	**Students are able to demonstrate the working principle of computer machine and its relevance to classical and modern problems of a computer design.**
	C221.2	**Students must be able to model the structure and behavior of various functional modules of a computer.**
	C221.3	**Students must be able to analyze techniques that computers use to communicate with I/O devices**
	C221.4	**Students are able to assess the performance of the processor using pipelining concept.**
Operating Systems(19A05403T)	C222.1	**Students can illustrate the functions of operating systems and its applications.**
	C222.2	**Student must be able to Apply appropriate memory and file management schemes.**
	C222.3	**Student must be able to analyze connection of application programs and hardware devices through system calls.**
	C222.4	**Student must be able to design solutions for various disk scheduling problems.**
	C222.5	**Student should be able to Investigate and illustrate various process scheduling algorithms**
PYTHON PROGRAMMING(19A05304T	C223.1	Apply the features of Python language in various real applications
	C223.2	Select appropriate data structure of Python for solving a problem.

)	C223.3	Design object oriented programs using Python for solving real-world problems.
	C223.4	Apply modularity to programs.
SOFTWARE ENGINEERING19A01407	C224.1	**Students are able to apply suitable software lifecycle to implement a product.**
	C224.2	**Student must be able to Apply engineering skill for planning and estimation of software projects.**
	C224.3	**Students are able to analyze the requirements for the development of a product and prepare SRS document.**
	C224.4	**Student must be able to design and develop correct and robust software products.**
	C224.5	Student must be able to analyze the quality control and how to ensure good quality software
FORMAL LANGUAGES AND AUTOMATA THEORY 19A05406T	C225.1	Student are able apply basic mathematical concepts to understand formal definitions of machine models.
	C225.2	Student must be able to design finite state diagrams while solving problems of computer science
	C225.3	Students are able to construct finite state machine by using regular expressions for the given language rules.
	C225.4	Student must be able to analyze formal grammars in automata theory
UNIVERSAL HUMAN VALUES 19A03403	C226.1	Students are expected to become more aware of themselves, and their surroundings (family, society, nature)
	C226.2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
	C226.3	They would have better critical ability.
	C226.4	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).
Python Programming Lab(19A05304P)	C227.1	**Apply the features of Python language in various real applications**
	C227.2	**Select appropriate core data structure of Python for solving a problem**
	C227.3	**Design object-oriented programs using Python for solving real-world problems**
	C227.4	**Apply modularity to programs**
	C227.5	**Design graphics using turtle module**
OPERATING STSTEM LAB19A03402P	C228.1	**Students are able to apply basic data structures to implement operating system functionalities.**
	C228.2	**Student must be able to analyze various scheduling problems.**
	C228.3	**Student must be able to apply algorithms for File and disk allocation and Management.**
	C228.4	**Students are able to investigate the insights of operating system to implement all its functions.**

NUMBER THEORY AND APPLICATIONS19A54401	**C229.1**	Understand number theory and its properties
	C229.2	Understand principles on congruences
	C229.3	Develop the knowledge to apply various applications
	C229.4	Develop various encryption methods and its applications
Environmental Science (19A99301)	**C229.1**	Grasp multidisciplinary nature of environmental studies and various renewable and nonrenewable resources.
	C229.2	Understand flow and bio-geo- chemical cycles and ecological pyramids.
	C229.3	Understand various causes of pollution and solid waste management and related preventive measures
	C229.4	About the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation
	C229.5	Casus of population explosion, value education and welfare programmes.
Computer Networks 19A05504T	**C311.1**	: Demonstrate various AI applications, languages and Intelligent Agents.
	C311.2	: Solve problems using search strategies and understand the basic process of Machine Learning. CO3: Apply classification and regression algorithms on real world data.
	C311.3	Develop an expert system.
	C311.4	Comprehend the structure of an artificial neural network and identify the building blocks of a convolutional neural network
	C311.5	
Artificial Intelligence19A05502T	**C312.1**	**: Demonstrate various AI applications, languages and Intelligent Agents.**
	C312.2	**: Solve problems using search strategies and understand the basic process of Machine Learning. CO3: Apply classification and regression algorithms on real world data.**
	C312.3	**Develop an expert system.**
	C312.4	**Comprehend the structure of an artificial neural network and identify the building blocks of a convolutional neural network**
Object Oriented Analysis Design & Testing19A05503T	**C313.1**	Students are able to model any applications using object oriented concepts.
	C313.2	Student must be able to develop class Diagrams, Object Diagram and Interaction Diagram.
	C313.3	Student must be able to develop the use cases, use cases Diagrams and Activity Diagram for the given applications.
	C313.4	Student must be able to design state chart Diagrams, Component Diagram and Deployment Diagram.
	C313.5	Student must be able to create a documentation of the project for the unified Library application
SOFTWARE TESTING	**C314.1**	**Student must be able to apply tools to reduce the problems in the real time Environ ment**

19A03505	C314.2	Student must be able to support in generating the test cases and test suites
	C314.3	Student must be able to design in test applications manually by applying different testing
	C314.4	Student must be able to identify the bugs through testing
	C314.5	Student must be able to analyze the basic testing procedures
Computer Applications in Food Industry19A27506b	C315.1	know about the various steps which are related to computer and Software and their application in Food Industries
	C315.2	know about the various steps which are necessary to implement the programs in 'C'
	C315.3	Design solutions for computational problems
	C315.4	Develop C programs which utilize the memory efficiently using programming constructs like pointer
ENGLISH COMMUNICATIONS 19A01506a	C316.1	Apply verbal and nonverbal skills in our day today life.
	C316.2	Understand the usage of English in this competitive era.
	C316.3	Implement interactive sessions to make the classroom learner centered
	C316.4	Examine the problems / situations and work effectively
	C316.5	Organize GD's and Debates to become professional
Computer Networks Lab	C317.1	Students are able to analyse basic transmissions of data by understanding OSI layers.
	C317.2	Students should be able to analyze various routing protocols and techniques and management issues
	C317.3	Students must be able to implement working principle of client/server application with application layer protocols
	C317.4	Students will be able to design new protocols thorough knowledge of computer network concepts
Object Oriented Analysis Design & Testing Lab(19A05503P)	C318.1	Students are able to model any applications using object oriented concepts.
	C318.2	Student must be able to develop class Diagrams, Object Diagram and Interaction Diagram.
	C318.3	Student must be able to develop the use cases, use cases Diagrams and Activity Diagram for the given applications.
	C318.4	Student must be able to design state chart Diagrams, Component Diagram and Deployment Diagram.
	C318.5	Student must be able to create a documentation of the project for the unified Library application
English Language Skills Lab (19A52601P)	C319.1	Understand the basic concepts of research and its methodologies
	C319.2	Analyze the research problem and apply appropriate sampling method for data collection
	C319.3	Apply different methods for analysis purpose

	C319.4	Analyze various types of testing tools used in research
Mandatory course: Constitution of India 19A99501	C31A.1	Design a research paper by following research ethics
	C31A.2	Analyze the research problem and apply appropriate sampling method for data collection
	C31A.3	Apply different methods for analysis purpose
	C31A.4	Analyze various types of testing tools used in research
	C31A.5	Design a research paper by following research ethics
Socially Relevant Project (19A04507)	C31B.1	**Identify the problem statement by observing the problems in the society, for which electronics engineers can propose a solution.**
	C31B.2	**Develop the design methodolgy for implementing the chosen project.**
	C31B.3	**Apply appropriate modern tools for implementing the project work.**
	C31B.4	**Evaluate application of project work with appropriate societal consideration.**
	C31B.5	**Develop presentation and interpersonal communication skills through presentations and documentation.**
SOFT SKILLS19A52604a	C321.1	Recognize the importance of verbal and non verbal skills
	C321.2	Develop the interpersonal and intrapersonal skills
	C321.3	Apply the knowledge in setting the SMART goals and achieve the set goals
	C321.4	Analyze difficult situations and solve the problems in stress-free environment.
	C321.5	Create trust among people and develop employability skills
Data warehousing and Data mining(19A12602T)	C322.1	Design a Data warehouse system and perform business analysis with OLAP tools
	C322.2	Apply suitable pre-processing and visualization techniques for data analysis
	C322.3	Develop frequent pattern and association rule mining techniques for data analysis
	C322.4	Build appropriate classification and clustering techniques for data analysis
	C322.5	Infer knowledge from raw data
WEB TECHNOLOGIES(19A52601T)	C323.1	Construct a basic website using HTML and Cascading Style Sheets
	C323.2	Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms
	C323.3	Develop server side programs using Servlets and JSP
	C323.4	Construct simple web pages in PHP and represent data in XML format.
	C323.5	**Utilize AJAX and web services to develop interactive web applications**
REAL TIME SYSTEMS(19A05603c)	C324.1	**Explain real-time concepts such as preemptive multitasking, task priorities, priority inversions, mutual exclusion, context switching, and synchronization, interrupt latency and response time,**

		and semaphores
	C324.2	**Describe how tasks are managed**
	C324.3	**Discuss how tasks can communicate using semaphores, mailboxes, and queues**
	C324.4	**Build a real-time system on an embedded processor**
	C324.5	**Examine the real time operating systems like RT Linux, Vx Works, MicroC /OSII, Tiny OS**
COMPILER DESIGN(19A05603a)	**C325.1**	Differentiate the various phases of a compiler
	C325.2	Identify the tokens and verify the code
	C325.3	Design code generator
	C325.4	Apply code optimization techniques
	C325.5	Design a compiler for a small programming language
Entrepreneurship & Incubation(19A52602a)	**C327.1**	Apply the concept of Entrepreneurship and challenges in the world of competition.
	C327.2	**Develop Knowledge in generating ideas for New Ventures.**
	C327.3	**Analyze various sources of finance and subsidies to entrepreneur/women Entrepreneurs.**
	C327.4	**Evaluate the role of central government and state government in promoting Entrepreneurship**
	C327.5	**Create and design business plan structure through incubations**
Web Technologies Lab(19A12601P)	**C328.1**	**Design the static web pages for an e-commerce web site.**
	C328.2	**Create a small Ajax-enabled rich application**
	C328.3	**Construct a basic website using HTML and Cascading Style Sheets.**
	C328.4	**Build dynamic web page with validation using Java Script**
	C328.5	**Develop Client/server side programs**
Data warehousing and Data mining Lab(19A12602P)	**C329.1**	**Extend the functionality of R by using add-onpackages.**
	C329.2	**Examine data from files and other sources and perform various data manipulation tasks onthem**
	C329.3	**Demonstrate Code statistical functions inR**
	C329.4	**Apply R Graphics and Tables to visualize results of various statistical operations ondata**
	C329.5	**Develop knowledge of R being gained to data analytics for real lifeapplications**
Socially Relevant Project(19A12604)	**C32A.1**	Identify the problem statement by observing the problems in the society, for which electronics engineers can propose a solution.
	C32A.2	Develop the design methodolgy for implementing the chosen project.
	C32A.3	Apply appropriate modern tools for implementing the project work.
	C32A.4	Evaluate application of project work with appropriate societal consideration.
	C32A.5	Develop presentation and interpersonal communication skills through presentations and documentation.

Internet of Things(19A05701T)	**C411.1**	Choose the sensors and actuators for an IoT application
	C411.2	Select protocols for a specific IoT application
	C411.3	Utilize the cloud platform and APIs for IoT applications
	C411.4	Experiment with embedded boards for creating IoT prototypes
	C411.5	Design a solution for a given IoT application
Cloud Computing(19A05703a)	**C412.1**	Outline the procedure for Cloud deployment
	C412.2	Distinguish different cloud service models and deployment models
	C412.3	Compare different cloud services
	C412.4	Design applications for an organization which use cloud environment.
Mobile Application Development(19A05505c)	**C413.1**	Identify various concepts of mobile programming that make it unique from programming forother platforms
	C413.2	Evaluate mobile applications on their design pros and cons.
	C413.3	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces
	C413.4	Develop mobile applications for the Android operating system that use basic and advanced phone features.
	C413.5	Demonstrate the deployment of applications to the Android marketplace for distribution
Air pollution and control(19A01704a)	**C414.1**	**Identify the sources of air pollution**
	C414.2	Understand the composition and structure and structure of atmosphere
	C414.3	Analysis of stack emissions and their behavior
	C414.4	Know about the noise sources, mapping, prediction equations
Management Science (19A52701b)	**C415.1**	Understand the concepts & principles of management and designs of organization in a practical world
	C415.2	Apply the knowledge of Work-study principles & Quality Control techniques in industry
	C415.3	Analyze the concepts of HRM in Recruitment, Selection and Training & Development
	C415.4	Evaluate PERT/CPM Techniques for projects of an enterprise and estimate time, cost of project & to analyze the business through SWOT
	C415.5	Create Modern technology in management science.
Internet of Things Lab(19A05701P)	**C416.1**	Choose the sensors and actuators for an IoT application
	C416.2	Select protocols for a specific IoT application
	C416.3	Utilize the cloud platform and APIs for IoT application

	C416.4	Experiment with embedded boards for creating IoT prototypes
Mobile Application Development Lab(19A12701)	C416.5	Design a solution for a given IoT application
	C417.1	Demonstrate the deployment of applications to the Android marketplace for distribution
	C417.2	Create data sharing with different applications and sending and intercepting SMS.
	C417.3	Develop applications using services and publishing android applications
	C417.4	To demonstrate their skills of using Android software development tool
Industrial Training/Skill Development/Research Project (19A04705)	C418.1	**Identify** and grab the internship opportunity.
	C418.2	**Develop** the skills required for doing the assigned project work.
	C418.3	**Apply** the skills and use the modern tools for implementing the assigned project work.
	C418.4	**Observe** the work environment and learn the work culture.
	C418.5	**Develop** presentation and interpersonal communication skills through presentations and documentation.
Global Warming and climate changes(19A01802b)	C421.1	An ability to apply knowledge of mathematics, science, and engineering
	C421.2	Design a system, component or process to meet desired needs with in realistic constraints such as economic ,environmental ,social ,political ,ethical ,health and safety , manufacturability and sustainability
	C421.3	identify, formulate, and solve engineering problems
	C421.4	Analysis of impacts on climate changes
DevOps(19A05801a)	C422.1	Explain how DevOps will balance the needs throughout the SDLC
	C422.2	Demonstrate how DevOps improves the collaboration and productivity by automation
	C422.3	Adapt DevOps in real time projects.
	C422.4	Illustrate the continuous integration tools andmonitoring tools
Project(19A05803)	C423.1	Identify and grab the internship opportunity.
	C423.2	Develop the skills required for doing the assigned project work
	C423.3	**Apply** the skills and use the modern tools for implementing the assigned project work.
	C423.4	**Observe** the work environment and learn the work culture.
	C423.5	**Develop** presentation and interpersonal communication skills through presentations and documentation.

- **LIFE-LONG LEARNING:** - Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.