DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE OUTCOMES (COS) OF ALL COURSES FRAMED UNDER

JNTUA-R19 REGULATION

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List of all courses offered by the institution for the regulation R19, JNTUA

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S.No	Course Code	Course Name	Year & Sem
57	19A04701T	Microwave Engineering and Optical Communications	**IV-I Sem**
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I B. Tech, I Sem ECE COs (R19-JNTUA)

Year & Sem	Course Code	Course Name	CO's	
I-I	19A54101	Algebra & Calculus	4101.1	Develop the use of matrix algebra techniques that is needed by engineers for practical applications. (L6)
			4101.2	Utilize mean value theorems to real life problems. (L3)
			4101.3	Familiarize with functions of several variables which is useful in optimization. (L6)
			4101.4	Familiarize with 2- dimensional coordinate systems. (L2)
			4101.5	Learn the Utilization of special functions such as Beta and Gamma Functions. (L2)

Year & Sem	Course Code	Course Name	CO's	
I-I	19A56101T	Applied Physics	6101T.1	Explain interference, diffraction, polarization. (L2)
			6101T.2	Describe dielectrics, magnetic materials (L2)
			6101T.3	Asses the electromagnetic wave propagation (L5)
			6101T.4	Interpret semiconductors (L2)
			6101T.5	Apply superconductivity, nano material techniques(L3).

Year & Sem	Course Code	Course Name		CO's
I-I	**19A05101T**	**Probem solving & programming**	5101T.1	Construct his own computer using parts (L6).
			5101T.2	Recognize the importance of programming language independent constructs (L2)
			5101T.3	Solve computational problems (L3)
			5101T.4	Select the features of C language appropriate for solving a problem. (L4)
			5101T.5	Design computer programs for real world problems. (L6)
			5101T.6	Organize the data which is more appropriated for solving a problem. (L6)

Year & Sem	Course Code	Course Name		CO's
I-I	**19A52101T**	**Communicative English 1**	2101T.1	Identify the need for understanding context, topic and specific information from social and transactional dialogues spoken by native speakers of English language. (L3)
			2101T.2	Apply rules of grammar for flawless writing and speaking with good vocabulary. (L3)
			2101T.3	List discourse markers to speak clearly on a specific topic/occasion in various discussions. (L4)
			2101T.4	Comprehend the texts after listening or reading and summarize them effectively. (L2)
			2101T.5	Infer a table/chart/graph by writing a paragraph coherently. (L2)

Year & Sem	Course Code	Course Name	CO's	
I-I	19A04101	Electronics and communication engineering workshop	4101.1	Assemble simple electronic circuits over a PCB (L3)
			4101.2	Interpret specifications (ratings) of the component (L5)
			4101.3	Demonstrate disassembling and assembling a Personal Computer and make the computer ready to use (L2)
			4101.4	Make use of Office tools for preparing documents, spread sheets and presentations (L3)
			4101.5	Demonstrate working of various communication systems (L2)

Year & Sem	Course Code	Course Name	CO's	
I-I	19A56101P	Applied Physics Lab	6101P.1	Describe optical instruments (exp no:1,2,3,4,5) (L2)
			6101P.2	Analyse magnetic intensity (exp no:7) (L4)
			6101P.3	determine mag. suscep., hall Coeff. (exp no:11,12)(L3)
			6101P.4	calculate the band gap, NA, AA (exp no:14,10) (L3)
			6101P.5	evaluate dielectric constant, B-H curve (exp no:6,9) (L3)

Year & Sem	Course Code	Course Name	CO's	
I-I	19A05101P	Problem solving and programming lab	5101P.1	Construct a Computer given its parts (L6)
			5101P.2	Select the right control structure for solving the problem (L6)
			5101P.3	Analyze different sorting algorithms (L4)
			5101P.4	Design solutions for computational problems (L6)
			5101P.5	Develop C programs which utilize the memory efficiently using programming constructs like pointers(L6)

Year & Sem	Course Code	Course Name	CO's	
I-I	19A52101P	Communicative English 1 lab	2101P.1	Assess their proficiency by listening to audio and video materials to develop their listening, speaking, reading and writing skills. (L5)
			2101P.2	Develop pronunciation, accent, stress, rhythm and all other aspects of the phonetics of a language for speaking and listening comprehension. (L3)
			2101P.3	Understand the nuances of English language with a focus on removing the influence of the mother tongue while conversing. (L2)
			2101P.4	Develop their communication skills and overcome the fear of public speaking by participating in GDs and role plays thereby make themselves employable. (L3)
			2101P.5	Evaluate and demonstrate acceptable etiquette required in social and professional contexts. (L5)

I B. Tech, II Sem ECE COs (R19-JNTUA)

Year & Sem	Course Code	Course Name	CO's	
I-II	19A04201T	Network theory	4201T.1	Determine the equivalent impedance of given network by using network reduction techniques and determine the current, voltage and power in any element(L3)
			4201T.2	Apply the network theorems suitably(L3)
			4201T.3	Compare behaviour of circuit elements during switching, Analyze transient response of RL RC RLC circuits(L2)
			4201T.4	classify magnetically coupled circuits and resonance phenomenon in electrical circuits(L2)
			4201T.5	Determine two port network parameters, understand the concept of transfer function and pole zeros of network function(L3)

Year & Sem	Course Code	Course Name	CO's	
I-II	19A54201	Differential Equations and Vector Calculus	4201.1	Solve the linear differential equations with constant coefficients by appropriate method (L3)
			4201.2	Classify and interpret the solutions of Linear Differential equations (L4)
			4201.3	Apply a range of techniques to find solutions of standard PDEs (L3)
			4201.4	Interpret the physical meaning of different operators such as gradient, curl and divergence. (L2).
			4201.5	Estimate the work done against a field, circulation and flux using vector calculus. (L4)

Year & Sem	Course Code	Course Name	CO's	
I-II	19A51102T	Chemistry	1102T.1	Discuss the MOT, Apply Schrodinger wave equation to H. (L3)
			1102T.2	Demonstrate the application of Fullerene, CNT and Nano particles(L2)
			1102T.3	Differentiate between pH metry, Potentiometry (L2)
			1102T.4	Discuss BUNA-S and BUNA-N Elastomers (L2)
			1102T.5	Understand the principles of analytical instruments (L2)

Year & Sem	Course Code	Course Name	CO's	
I-II	19A05201T	Data structures	5201T.1	Select Appropriate Data Structure for solving a real world problem . (L4)
			5201T.2	Select appropriate file organization technique depending on the processing to be done (L4)
			5201T.3	Construct Indexes for Databases (L6)
			5201T.4	5201.4 Analyse the Algorithms (L4)
			5201T.5	5201.5 Develop Algorithm for Sorting large files of data (L3)

Year & Sem	Course Code	Course Name	CO's	
I-II	19A03101	Engineering workshop	3101.1	Apply wood working skills in real world applications(L3)
			3101.2	Build different parts with metal sheets in real world applications(L6)
			3101.3	Apply fitting operations in various applications.(L3)
			3101.4	Apply different types of basic eclectic circuit connections.(L3)
			3101.5	Preparation of moulds and castings .(L3)

Year & Sem	Course Code	Course Name	CO's	
I-II	19A03102	Engineering graphics lab	3102.1	Use computers as a drafting tool(L2)
			3102.2	Draw isometric and orthographic drawings using CAD packages(L3)
			3102.3	Analyzing 3 dimensional objective .(L4)

Year& Sem	Course Code	Course Name	CO's	
I-II	19A04201P	Network theory lab	4201P.1	Verify Kirchoff's laws and network theorems (L4)
			4201P.2	Measure time constants of RL & RC circuits (L3)
			4201P.3	Analyze behavior of RLC circuit for different cases (L4)
			4201P.4	Design resonant circuit for given specifications (L6)
			4201P.5	Characterize and model the network in terms of all network parameters (L3)

Year & Sem	Course Code	Course Name	CO's	
I-II	**19A51102P**	**Chemistry Lab**	1102P.1	Determine the cell constant and conduct of the solutions. (L3)
			1102P.2	Estimate the ferrous iron and Strength of an acid in battery. (L2)
			1102P.3	Prepare the advanced materials and analyse the properties. (L3)
			1102P.4	Analyse the IR and NMR spectroscopy. (L3)
			1102P.5	Analyse the saperation method of HPLC and TLC (L3)

Year& Sem	Course Code	Course Name	CO's	
I-II	**19A05201P**	**Data structures lab**	5201P.1	Select the data structure appropriate for solving the problem (L5)
			5201P.2	Implement searching and sorting algorithms (L3)
			5201P.3	Design new data types (L6)
			5201P.4	Illustrate the working of stack and queue (L4)
			5201P.5	Organize the data in the form of files (L6)

II B. Tech, I Sem ECE COs (R19-JNTUA)

Year& Sem	Course Code	Course Name		CO's
II-I	19A54302	COMPLEX VARIABLES AND TRANSFORMS	4302.1	Understand the analyticity of complex functions and conformal mappings (L2)
			4302.2	Apply Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals (L3)
			4302.3	Understand the usage of Laplace transform (L2)
			4302.4	Evaluate the Fourier series expansion of periodic functions (L6)
			4302.5	Understand the use of Fourier transforms and apply z-transforms to solve difference equations (L2)

Year& Sem	Course Code	Course Name		CO's
II-I	19A04301	Signals and systems	4301.1	Understand different types of signals and systems and describe vector analysis (L2)
			4301.2	Examine the spectral properties of periodic and a periodic signals using Fourier Series and Fourier Transform and understand process of sampling (L3).
			4301.3	Understand different types of signals and system with Laplace Transform (L2).
			4301.4	Describe system properties based on Impulse response and Fourier analysis (L2).
			4301.5	Examine the spectral properties of signals using Discrete Time Fourier Transform and Z-Transforms (L3)

Year& Sem	Course Code	Course Name		CO's
II-I	19A04302T	Electronic Devices and Circuits	4302T.1	Understand principle, operation, characteristics and applications of Bipolar Junction Transistor and Field Effect Transistor (L2)
			4302T.2	Describe basic operation and characteristics of various semiconductor devices.(L2)
			4302T.3	Analyze diode circuits for different applications such as rectifiers, clippers and clampers also analyze low frequency and high frequency models of BJT and FET. (L4)
			4302T.4	Design various biasing circuits for BJT and FET. (L6)
			4302T.5	Compare the performance of various semiconductor devices. (L4)

Year& Sem	Course Code	Course Name		CO's
II-I	19A04303	Probability Theory and Stochastic Processes	4303.1	Understanding the concepts of probability, random variables, random process , probability distribution and density functions ,Noise, random process random process , band pass process (L2)
			4303.2	Evaluate the single and multiple random variables concepts to expectation, variance and moments (L5)
			4303.3	Apply different operations on multiple random variables (L3)
			4303.4	Analyze the spectral characteristics of random process (L4)
			4303.5	Derive the response of Linear system with random signals as inputs (L4)

Year& Sem	Course Code	Course Name	CO's	
II-I	**19A04304**	**Digital electronics and Logic design**	4304.1	Understand the various number systems, error detecting , correcting binary codes,logic families,apply Boolean laws,K-map-methods to minimize switching functions(L2)
			4304.2	Apply Boolean algebra for describing combinational digital circuits,design various combinational logic circuits and analyze standard combinational circuits such as adders,subtractors,multipliers and comparators(L3)
			4304.3	Design of synchronous sequential circuits and construct digital systems using components such s registers and counters(L6)
			4304.4	Compare different types of logic devices and Logic families(L4)
			4304.5	Understand digital logic families such as TTL,ECL, and CMOS . Explain the characteristics of digital ICS such as speed,power dissipation, figure of merit,and fan out , noise immunity(L2)

Year& Sem	Course Code	Course Name	CO's	
II-I	**19A02304T**	**Electrical technology**	2304T.1	Calculate the e.m.f. generated on DC Generator also able to control speed of different DC motors.(L4)
			2304T.2	Conduct open circuit and short circuit tests on single phase transformer for knowing their characteristics.(L3)
			2304T.3	Analyze three phase circuits, three induction motor operating principle and know their torque slip characteristics.(L4)
			2304T.4	Knowledge on synchronous machine with which he/she can able to apply the above conceptual things to real-world problems and applications(L1)
			2304T.5	Analyze the complex circuits of R L C circuits (L3)

Year& Sem	Course Code	Course Name	CO's	
II-I	**19A04302P**	**Electronic Devices and Circuits Lab**	4302P.1	Understand the basic characteristics and applications of basic electronic devices. (L2)
			4302P.2	Understand the basic characteristics and applications of basic electronic devices. (L2)
			4302P.3	Analyze the Characteristics of UJT, BJT, FET, and SCR (L4).
			4302P.4	Design FET based amplifier circuits/BJT based amplifiers for the given specifications.(L6)
			4302P.5	Simulate all circuits in PSPICE /Multisim. (L6)

Year& Sem	Course Code	Course Name	CO's	
II-I	**19A04305**	**Basic Simulation Lab**	4305.1	Understand the use of MATLAB software and know syntax of MATLAB programming (L2).
			4305.2	Understand how to simulate different types of signals and system response (L2).
			4305.3	Compute the Fourier Transform of a given signal and plot amplitude and phase characteristics (L3).
			4305.4	Analyze the response of different systems when they are excited by different signals and plot power spectral density of signals (L4).
			4305.5	Generate/Simulate different random signals for the given specifications (L6).

Year& Sem	Course Code	Course Name	CO's	
II-I	**19A02304P**	**Electrical Technology Lab**	2304P.1	Understands the responses of basic electrical parameters (L2)
			2304P.2	To determine the various parameters experimentally (L5).
			2304P.3	To understand various characteristics of DC generators and DC motors (L2).
			2304P.4	To predetermine the efficiency and regulation of a 1-ϕ transformer (L3).

Year& Sem	Course Code	Course Name	CO's	
II-I	**19A99302**	**Biology For Engineers**	9302.1	Explain about cells and their structure and function. Different types of cells and basics for classification of living Organisms(L2)
			9302.2	Explain about biomolecules, their structure and function and their role in the living organisms. How biomolecules are useful in Industry.(L2)
			9302.3	Briefly about human physiology.(L2)
			9302.4	Explain about genetic material, DNA, genes and RNA how they replicate, pass and preserve vital information in living Organisms. (L2)
			9302.5	Know about application of biological Principles in different technologies for the production of medicines and Pharmaceutical molecules through transgenic microbes, plants and animals(L2)

II B. Tech, II Sem ECE COs (R19-JNTUA)

Year& Sem	Course Code	Course Name	CO's	
II-II	19A04401	Electromagnetic Waves and Transmission lines	4401.1	Explain basic laws of electromagnetic fields and know the wave concept (L2)
			4401.2	Analogy between electric and magnetic fields(L5)
			4401.3	Solve the problems related to Electro magnetic fields(L3)
			4401.4	Derive Maxwell's equations for static and time varying fields(L3)
			4401.5	Explain the transmission lines with equivalent circuit and explain their characteristic with various lengths(L2)

Year& Sem	Course Code	Course Name	CO's	
II-II	19A04402T	Electronic Circuits – Analysis and Design	4402T.1	Understand low frequency and high frequency models of BJT and FET Amplifiers.(L2)
			4402T.2	Analyze the frequency response of single stage amplifiers using BJT and FET. (L3)
			4402T.3	Design differential amplifiers using BJT and FET and also various multi-stage amplifiers. (L6)
			4402T.4	Describe the characteristics of various types of feedback configurations and design oscillators.(L6)
			4402T.5	Evaluate efficiency of large signal power amplifiers and tuned amplifiers.(L5)

Year& Sem	Course Code	Course Name	CO's	
II-II	**19A02404**	**Control Systems**	2404.1	Understand the concepts of control systems classification, feedback effect, mathematical modelling, time response and frequency response characteristics, state space analysis(L2)
			2404.2	Apply the concepts of Block diagram reduction(L3)
			2404.3	Analyze Signal flow graph method and state space formulation for obtaining mathematical and Root locus, Bode, Nyquist, Polar plots for stability calculations, controllability and observability and demonstrate the use of these techniques.(L4)
			2404.4	Analyse time response analysis, error constants, and stability characteristics of a given mathematical model using different methods.(L4)
			2404.5	Design and develop different compensators, controllers and their performance evaluation for various conditions. Implement them in solving various engineering applications.(L6)

Year& Sem	Course Code	Course Name	CO's	
II-II	**19A04403T**	**Analog Communications**	4403T.1	Understand the concepts of various Amplitude, Angle and Pulse Modulation schemes. Understand the concepts of information theory with random processes. (L2)
			4403T.2	Apply the concepts to solve problems in analog and pulse modulation schemes. (L3)
			4403T.3	Analysis of analog communication system in the presence of noise. (L4)
			4403T.4	Compare and contrast design issues, advantages, disadvantages and limitations of various modulation schemes in analog communication systems.(L4)
			4403T.5	Solve basic communication problems & calculate information rate and channel capacity of a discrete communication channel (L3)

Year& Sem	Course Code	Course Name	CO's	
II-II	19A05304T	Python Programming	5304T.1	Apply the features of Python language in various real applications
			5304T.2	Select appropriate data structure of Python for solving a problem(L1)
			5304T.3	Design object oriented programs using Python for solving real-world problems.(L6)
			5304T.4	Apply modularity to programs(L3)
			5304T.5	Explore the use of Object oriented concepts to solve Real-life problems (L4)

Year& Sem	Course Code	Course Name	CO's	
II-II	19A04404	Computer Architecture and Organization	4404.1	Conceptualize basics of organizational and architectural issues of a digital computer (L4)
			4404.2	Emphasize representation of data types, numbers employed in arithmetic operations and binary coding of symbols used in data processing (L5)
			4404.3	Develop low-level programs to perform different basic instructions (L5)
			4404.4	Analyze various issues related to memory hierarchy (L4)
			4404.5	Design basic computer system using the major components (L6)

Year & Sem	Course Code	Course Name		CO's
II-II	**19A52301**	**Universal Human Values**	2301.1	Students are expected to become more aware of themselves, and their surroundings (family,society, nature)(L2)
			2301.2	They would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.(L5)
			2301.3	They would have better critical ability.(L4)
			2301.4	They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society).(L5)
			2301.5	It is hoped that they would be able 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(L3)

Year& Sem	Course Code	Course Name		CO's
II-II	**19A04402P**	**Electronic Circuits – Analysis and Design Lab**	4402P.1	Understand Characteristics and frequency response of various amplifiers (L2)
			4402P.2	Analyze negative feedback amplifier circuits, oscillators, Power amplifiers, Tuned amplifiers. (L4)
			4402P.3	Determine the efficiencies of power amplifiers (L3)
			4402P.4	Design RC and LC oscillators, Feedback amplifier for specified gain and multistage amplifiers for Low, Mid and high frequencies (L6)
			4402P.5	Simulate all the circuits and compare the performance.(L6)

Year & Sem	Course Code	Course Name	CO's	
II-II	19A04403P	Analog Communications Lab	4403P.1	Understand different analog modulation techniques &Radio receiver characteristics.(L2)
			4403P.2	Analyze different analog modulation techniques. (L4)
			4403P.3	Design and implement different modulation and demodulation techniques.(L6)
			4403P.4	Observe the performance of system by plotting graphs & Measure radio receiver characteristics. (L3)
			4403P.5	Simulate all digital modulation and demodulation techniques. (L6)

Year & Sem	Course Code	Course Name	CO's	
II-II	19A99301	Environmental Science	9301.1	Grasp multidisciplinary nature of environmental studies and various renewable and non renewable resources.(L1)
			9301.2	Understand flow and bio-geo- chemical cycles and ecological pyramids(L2)
			9301.3	Understand various causes of pollution and solid waste management and related preventive measures.(L2)
			9301.4	Understand about the rainwater harvesting, watershed management, ozone layer depletion and waste land reclamation(L2)
			9301.5	Casus of population explosion, value education and welfare programmes.(L1)

Year & Sem	Course Code	Course Name	CO's	
III-I	**19A04501T**	**INTEGRATED CIRCUITS AND APPLICATIONS**	4501T.1	Understanding the basic building blocks of Op-Amps & specialized ICs (L2)
			4501T.2	To Explain DC & AC performance Characteristics of Op-Amps (L2)
			4501T.3	To Impart Knowledge on linear and non-linear applications of Op-Amps.(L3)
			4501T.4	To describe operation and characteristics of data converters.(L2)
			4501T.5	Design various circuits using Op-Amps and 555 timer, PLL, Voltage regulators (L6)

Year & Sem	Course Code	Course Name	CO's	
III-I	**19A04502**	**ANTENNAS AND WAVE PROPAGATION**	4502.1	Understand various antenna parameters, principle of operation of various antennas viz. wired, aperture, micro strip antennas. (L1)
			4502.2	Discuss various EM wave propagation methods in ionosphere and troposphere(L2)
			4502.3	Analyze mathematical aspects of wave propagation, Derive expressions related to radiation mechanisms for antennas (L3)
			4502.4	Design various antennas namely array, micro strip, horn, lens and aperture antennas, etc., for a given application.(L4)
			4502.5	Compare performance of various antennas.(L5)

Year & Sem	Course Code	Course Name		CO's
III-I	19A52601T	ENGLISH LANGUAGE SKILLS	2601T.1	Understand the purpose of rhythm and rhyme making the presentation lively and attractive. (L2)
			2601T.2	Apply the knowledge of structure and style in a presentation, identify the audience and make note of key points. (L3)
			2601T.3	Evaluate reading/Listening texts and to write summaries based on global comprehension of these texts. (L5)
			2601T.4	Express thoughts and ideas with acceptable accuracy and fluency. (L1)
			2601T.5	Create a coherent paragraph interpreting figure/graph/chart/table (L4)

Year & Sem	Course Code	Course Name		CO's
III-I	19A04503T	DIGITAL COMMUNICATIONS	4503T.1	Understand source coding techniques & pulse modulation techniques. (L2)
			4503T.2	Compare the power bandwidth required for various pass band data transmission scheme.(L4)
			4503T.3	Understand the concepts of signal space analysis. (L2)
			4503T.4	Analyse the different digital modulation techniques, generation and detection, power spectra and their probability of error performance. (L3)
			4503T.5	Apply information theory and linear algebra in source coding and channel coding. (L3)

Year & Sem	Course Code	Course Name		CO's
III-I	**19A04504a**	DATA COMMUNICATIONS AND NETWORKS	4504a.1	Explain about network hardware & software, reference models, and various example networks. (L3)
			4504a.1	Explain various transmission media, switching circuits, DSL, SONET and IEEE standards. (L3)
			4504a.1	Explain various datalink protocols, channelization protocols, datalink layer devices and 802.11. (L3)
			4504a.1	Explain about Internet protocol, routing protocols, and transport protocols (L3)
			4504a.1	Understand about various services supported at application layer level. (L2)

Year & Sem	Course Code	Course Name		CO's
III-I	**19A52506a**	TECHNICAL COMMUNICATION AND PRESENTATION SKILLS	2506a.1	Understand the purpose of rhythm and rhyme making the presentation lively and attractive. (L2)
			2506a.2	Apply the knowledge of structure and style in a presentation, identify the audience and make note of key points. (L3)
			2506a.3	Evaluate reading/Listening texts and to write summaries based on global comprehension of these texts. (L5)
			2506a.4	Express thoughts and ideas with acceptable accuracy and fluency. (L1)
			2506a.5	Create a coherent paragraph interpreting figure/graph/chart/table (L4)

			CO's	
III-I	19A04501P	INTEGRATED CIRCUITS AND APPLICATIONS LAB	4501P.1	Understand the working of Op amp ICs & Application specific analog ICs. (L2)
			4501P.2	Analyse operational amplifier-based circuits for linear and non-linear applications. (L3)
			4501P.3	Design Operational amplifiers for linear and nonlinear application, Multivibrator circuits using 555 & application specific ICs.(L6)
			4501P.4	Simulate all linear and nonlinear application based Op amp Circuits and circuits based on application specific ICs. (L3)
			4501P.5	Compare theoretical, practical & simulated results in integrated circuits.(L2)

Year & Sem	Course Code	Course Name		CO's
III-I	19A52601P	ENGLISH LANGUAGE SKILLS LAB	2601P.1	Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills[L1]
			2601P.2	Apply communication skills through various language learning activities[L2]
			2601P.3	Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension. [L4]
			2601P.4	Evaluate and exhibit acceptable etiquette essential in social and professional settings.[L6]
			2601P.5	Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.[L6]

			CO's	
III-I	**19A04503P**	**DIGITAL COMMUNICATIONS LAB**	4503P.1	Identify various multiplexing techniques in communications(L1)
			4503P.2	Understand the fundamental concepts on TDM, Pulse modulations& digital modulation techniques. (L2)
			4503P.3	Evaluate the performance of PCM, DPCM and DM in a digital communication(L5)
			4503P.4	Understand how to use MATLAB software and hardware effectively and creatively to synthesis digital communication systems(L2)

Year & Sem	Course Code	Course Name	CO's	
III-I	**19A99601**	**RESEARCH METHODOLOGY**	9601.1	Understand basic concepts and its methodologies(L2)
			9601.2	Demonstrate the knowledge of research processes (L3)
			9601.3	Read. comprehend and explain research articles in their academic discipline(L2)
			9601.4	Analyse various types of testing tools used in research (L4)
			9601.5	Design a research paper without any ethical issues(L5)

III B. Tech, II Sem ECE COs (R19-JNTUA)

Year & Sem	Course Code	Course Name	CO's	
III-II	19A04601T	MICROPROCESSORS & MICROCONTROLLERS	4601T.1	Summarize features of a microprocessor (L2)
			4601T.2	Understand instruction set of 8086 microprocessors (L1)
			4601T.3	Describe interfacing of 8086 with peripheral devices (L2)
			4601T.4	Distinguish between microprocessor and a microcontroller (L5)
			4601T.5	Explain architecture and addressing modes of ARM Cortex M0+. (L2)

Year & Sem	Course Code	Course Name	CO's	
III-II	19A04602T	DIGITAL SIGNAL PROCESSING	4602T.1	Compute the fast Fourier transforms and find the relationship with other transforms (L3)
			4602T.2	Understand the basic concepts of IIR filters and FIR filters (L2).
			4602T.3	Design of IIR and FIR digital filters (L6).
			4602T.4	Understand the DSP building blocks to achieve high speed in DSP processor (L2).
			4602T.5	Understand the DSP TMS320C54XX architecture and instructions (L2).

Year & Sem	Course Code	Course Name	CO's	
III-II	19A04603	DIGITAL SYSTEM DESIGN THROUGH VHDL	4603.1	Understand the architecture of FPGAs, tools used in modelling of digital design and modelling styles in VHDL (L2)
			4603.2	Learn the IEEE Standard 1076 Hardware Description Language (VHDL) (L2)
			4603.3	Analyze and design basic digital circuits with combinatorial and sequential logic circuits using VHDL (L4)
			4603.4	Model complex digital systems at several levels of abstractions, behavioural, structural (L5)
			4603.5	Design complex digital CPU, vending machine and washing machines etc and analyse the case studies (L4)

Year & Sem	Course Code	Course Name	CO's	
III-II	19A04605e	PRINCIPLES AND TECHNIQUES OF MODERN RADAR SYSTEMS	4605e.1	Understand the basic principles of RADAR and its Variants. (L2)
			4605e.2	Apply the fundamental knowledge of various Radars like CW Radar, FM-CW and MTI Radars. (L3)
			4605e.3	Analyze the received data from the target using CW Radar and MTI Radar and to find the tracking range for clutter analysis. (L4)
			4605e.4	Analyze probability of detection, false alarm and modified Radar range equation. (L4)
			4605e.5	Understand the Radar based microwave imaging and modern applications of RADAR PRINCIPLES. (L2)

Year & Sem	Course Code	Course Name	CO's	
III-II	**19A52604a**	**SOFT SKILLS**	4604a.1	Understand the importance of soft skills (L2)
			4604a.2	Develop creative thinking and decision-making skills (L6)
			4604a3	Understand the importance of interpersonal skills (L2)
			4604a.4	Apply verbal skills personal and professional life (L3)
			4604a.5	Apply various techniques to use para language (L3)

			CO's	
III-II	**19A52602b**	**MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS**	4602b.1	Get the basic inputs of Managerial Economics and demand concept and able to estimate the future demand of a product. (L2)
			4602b.2	Explain the concepts of cost and production and can calculate the breakeven point. (L2)
			4602b.3	Learn how to take effective decisions under various market situations and also about different forms of business organizations. (L2)
			4602b.4	Get the inputs of accounting concepts and analyse the financial statements.(L4)
			4602b.5	Know how to take an effective investment decision. (L2)

Year & Sem	Course Code	Course Name	CO's	
III-II	19A04602P	DIGITAL SIGNAL PROCESSING LAB	4602P.1	Understand the generation of sinusoidal signal using software and hardware (L2).
			4602P.2	Compute the convolution and correlation of sequences using software and hardware (L3).
			4602P.3	Compute the FFT of a sequence using software and hardware (L3).
			4602P.4	Design of FIR filter using software and hardware (L6).
			4602P.5	Design of IIR filter using software and hardware (L6).

Year & Sem	Course Code	Course Name	CO's	
III-II	19A04601P	MICROPROCESSORS AND MICROCONTROLLERS LAB	4601P.1	Execution of different programs for 8086 in Assembly Level Language using 8086 kits. (L3)
			4601P.2	Execution of different programs for 8051 in Assembly Level Language using 8051 kits. (L3)
			4601P.3	Design and implement some specific real time applications. (L6)
			4601P.4	Execution of multiplying two 3*3 matrices and print on DOS. (L3)
			4601P.5	Execute programs ARM-CORTEX M0(L3)

Year & Sem	Course Code	Course Name	CO's	
III-II	19A99501	CONSTITUTION OF INDIA	9501.1	Understand historical background of the constitution making and its importance for building a democratic India (L2)
			9501.2	Understand the functioning of three wings of the government ie., executive, legislative and judiciary (L2)
			9501.3	Understand the value of the fundamental rights and duties for becoming good citizen of India (L2)
			9501.4	Analyze the decentralization of power between central, state and local self-government (L4)
			9501.5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy (L3)

Year & Sem	Course Code	Course Name	CO's	
IV-I	19A04701T	MICROWAVE ENGINEERING AND OPTICAL COMMUNICATIONS	4701T.1	Understand the concept of wave propagation in the guides (L1)
			4701T.2	Understand principle of operation of all passive microwave devices (L1)
			4701T.3	Differentiate Linear bean tubes and crossed field tubes in terms of operation and performance (L5)
			4701T.4	Remember the optical fiber types, modes, configurations, and signal degradation types (L1)
			4701T.5	Compare the performance of various optical source and detectors (L4)

Year & Sem	Course Code	Course Name	CO's	
IV-I	19A04702T	VLSI DESIGN	4702T.1	Design MOSFET based logic circuits (L4).
			4702T.2	Estimate the sheet resistance, square capacitance and propagation delays in CMOS circuits (L3)
			4702T.3	Design amplifier circuits using MOS transistors (L4).
			4702T.4	Design MOSFET based logic circuits using various logic styles like static and dynamic CMOS (L4)
			4702T.5	Identify the design for testability methods for combinational & sequential CMOS circuits (L1).

Year & Sem	Course Code	Course Name	CO's	
IV-I	**19A04703c**	**EMBEDDED SYSTEMS**	4703c.1	Discuss basic hardware and software units used in embedded systems (L3)
			4703c.2	Summarize different factors to be considered in the selection of memory for an embedded system (L2)
			4703c.3	Describe uses of hardware and software assigned priorities in an interrupt service mechanism (L2)
			4703c.4	Explain IPC functions to enable communication of signals, semaphores and messages from ISRs and tasks (L2)
			4703c.5	Build RTOS based embedded system using Keil RTX mbed platform (L6)

Year & Sem	Course Code	Course Name	CO's	
IV-I	**19A05704b**	**CYBER SECURITY**	5704b.1	Explain Vulnerabilities, threats and. Counter measures for computer security(L2)
			5704b.2	Outline the attacks on browser, Web and email. (L2)
			5704b.3	Design the Counter measures to defend the network security attacks. (L6)
			5704b.4	Interpret the need for Privacy and its impacts of Emerging Technologies. (L2)
			5704b.5	Adapt legal issues and ethics in computer security. (L6)

Year & Sem	Course Code	Course Name	CO's	
IV-I	19A52701b	MANAGEMENT SCIENCE	2701b.1	Understand the concept of management and organization. (L2)
			2701b.2	Apply the knowledge of Quality Control, Work-study principles in real life industry. (L3)
			2701b.3	Understand the concepts of HRM in Recruitment, Selection, Training & Development. (L2)
			2701b.4	Understand Mission, Objectives, Goals & strategies for an enterprise. (L2)
			2701b.5	Understand modern management techniques. (L2)

Year & Sem	Course Code	Course Name	CO's	
IV-I	19A04701P	MICROWAVE AND OPTICAL COMMUNICATIONS LAB	4701P.1	Understand the mode characteristics of Reflex Klystron oscillator and negative resistance characteristics of Gunn Oscillator. (L2)
			4701P.2	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 fibre. (L2)
			4701P.3	Analyse the radiation characteristics to find the directivity and HPBW of a given antenna. (L4)
			4701P.4	Design optical link between transmitter and receiver experimentally to find attenuation and signal strength of the received signal. (L6)

Year & Sem	Course Code	Course Name	CO's	
IV-I	**19A04702P**	**VLSI DESIGN LAB**	4702P.1	Understand and develop HDL source code for the given problem/experiment. (L2)
			4702P.2	Analyse the obtained results of the given experiment/problem. (L4)
			4702P.3	Solve the given circuit with suitable simulator and verify the results(L6)
			4702P.4	Design and implement the experiments using FPGA/CPLD hardware tools(L6)

IV B. Tech, II Sem ECE COs (R19-JNTUA)

Year & Sem	Course Code	Course Name	CO's	
IV-II	19A04801e	ANALOG IC DESIGN	4801e.1	Analyse Small-Signal and Large-Signal Modelling of MOS Transistor (L3)
			4801e.2	Design current mirror circuits using MOSFETs and Compare different Current mirror Circuits. (L4, L5)
			4801e.3	Analyse Analog circuits like Differential amplifiers, current amplifiers, inverters (L3)
			4801e.4	Model and simulate different MOS Devices using small signal Model. (L4)
			4801e.5	Characterize two stage and open loop Comparators and Design Comparator circuits using MOSFET (L2, L4)
			CO's	
IV-II	19A05802b	MEAN STACK TECHNOLOGIES	5802b.1	Summarize the protocols related to Internet & WWW and Compare and contrast XML and HTML(L2, L5)
			5802b.2	Illustrate the importance of JavaScript and Develop applications using Angular JS (L2, L6)
			5802b.3	Explain the Node JS modules and Make use of MVC in Express (L2, L3)
			5802b.4	Outline the RESTful Web Services and Assess the future of React JS(L2, L5)
			5802b.5	Explain the features and architecture of Mongo DB and Create and collect Database in MongoDB(L2, L6)

Year & Sem	Course Code	Course Name	CO's	
IV-II	**19A04803**	**Project**	4803.1	Identify problems, formulate literature survey and analyze engineering problems. (L1, L4)
			4803.2	Apply the theoretical concepts to solve industrial problems with teamwork and multidisciplinary approach(L3)
			4803.3	Design system component that acquires the need for public health and environment consideration. (L6)
			4803.4	Form a team for carrying the project and perform documentation effectively. (L6)