

## CO's Data (2015 SCHEME)

Sno	Subject code	Title	Course Outcomes
1	15MAT31	Engg. Mathematics - III	<p>CO1: Find Fourier series of periodic functions.</p> <p>CO2: Evaluate Fourier transform, solve difference equations using Z-Transform.</p> <p>CO3: Apply statistical and numerical methods to fit the given data into appropriate curves and to solve algebraic, transcendental equations.</p> <p>CO4: Apply various numerical techniques to interpolate, evaluate definite integrals</p> <p>CO5: Use curl and divergence vector integration, to verify green's stroke's divergence theorems and to evaluate geodesics.</p>
2	15EC32	Analog Eelectronics	<p>CO1: Acquire knowledge of Working principle, characteristics and basic applications of BJT, construction, working principle of FET, Single stage, cascaded and feedback amplifier configurations, Frequency response characteristics of BJT and FET, Power amplifier classifications such as Class A, Class B and Voltage Regulators etc.</p> <p>CO2: Analyze small signal ac equivalent circuits using BJT and FET, low and high frequency response using BJT and FET, Feedback Circuits in terms of impedances and gain.</p> <p>CO3: Prove the performance of power amplifiers in terms of efficiency.</p> <p>CO4: Design oscillators with the help of feedback circuits.</p> <p>CO5: Interpret performance characteristics of transistors amplifiers and FETs.</p>
3	15EC33	Digital Electronics	<p>CO1: Apply the fundamental concepts, terminology of logic design and different Boolean postulates to solve the given problem.</p> <p>CO2: Apply the various simplification methods (K-map, Quin-Muclusky, MEV) to simplify the expression in a given problem.</p> <p>CO3: Apply the knowledge of basic combinational components to design the other combinational circuits.</p> <p>CO4: Analyse the concepts of sequential circuits and differentiate the types of sequential circuits.</p> <p>CO5: Design the various sequential circuits like registers, counters, and Mealy and Moore circuits.</p>

4	15EC34	Network Analysis	<p>CO1: Understand the basic concepts in analysing networks such as mesh,node,star-delta,source transformation &amp; shifting and evaluate appropriate method to find voltage and current for any given network.</p> <p>CO2: State and prove network theorems such as superposition, millmans ,max power transfer...etc and demonstrate appropriate theorems to find the voltage or current in any given network.</p> <p>CO3: Differentiate between series and parallel resonance circuit and also demonstrate using frequency response for any circuit to find performance metrics like quality factor, bandwidth...etc.</p> <p>CO4: Define various 2 port network parameters Z,Y,h,T and establish relationshipbetween different parameters and formulate equations governing the behaviour of the network.</p> <p>CO5: List different standard inputs in analyzing the networks like step, ramp,impulse also analyze waveform synthesis using different inputs and apply the concepts of laplace transformation for a given network.</p>
5	15EC35	Electronics Instrumentation	<p>Co1: Describe analog instruments voltmeters and multimeters with error free readings</p> <p>Co2: Evaluate the functionality of digital instruments (such as DVM's, digital multi meter, digital frequency meter digital measurement of time) for measuring digital frequency, digital time, etc..</p> <p>Co3: Apply the working principle of different oscilloscopes(delayed time base oscilloscope, analog ,sampling and digital storage oscilloscope) and signal generators(standard signal generators, laboratory type, square, pulse, frequency generators) for measuring amplitude, time and frequency</p> <p>Co4: Analyze the function of measuring instruments to calculate power, impedance, electric field strength, PH etc, and AC and DC bridges to measure resistance, capacitance and inductance</p> <p>Co5:Illustrate the functions of transducers (active and passive) with the help of bridge circuits</p>

6	15EC36	Engineering Electromagnetics	<p>CO1: Solve problems on Electric force, electric field intensity due to point, linear, volume charges by applying Coulombs Law and Guass Law</p> <p>CO2: Determine Energy and Potential for various charge distributions and apply continuity equation of current to calculate flow of current, total charge, charge density etc for Conductors</p> <p>CO3: Apply Poissons and Laplace equations for solving boundary value problems associated with electrostatics and magnetostatics.</p> <p>CO4: Analyze the applications of magnetostatics by applying biot-savart law, amphere's circuital law and derive the concepts of magnetic forces and materials to characterize the magnetic circuits.</p> <p>CO5: Analyze Maxwell's equations for Static fields, time varying fields, EM waves in free space, conductors and Evaluate power associated with EM waves using Poynting theorem.</p>
7	15ECL37	Analog Electronics Lab	<p>CO1: Design and test rectifiers, clipping circuits, clamping circuits and voltage regulators for given specifications.</p> <p>CO2: Design and test BJT/FET amplifiers to find gain and bandwidth for given specifications.</p> <p>CO3: Plot the characteristics of JFET/MOSFET devices and calculate the parameters namely drain resistance, mutual conductance and amplification factor.</p> <p>CO4: Design oscillator circuit using BJT/FET for specific frequency.</p> <p>CO5: Calculate the efficiency of Class B push pull power amplifier using BJT.</p>
8	15ECL38	Digital Electronics Lab	<p>CO1: Demonstrate the truth table of various expressions and combinational circuits using logic gates.</p> <p>CO2: Design ,test and evaluate combinational circuits such as Adder,Subtractor and Code converters.</p> <p>3: Design, test and evaluate combinational circuits such as Decoder, Encoder and Multiplexers.</p> <p>CO4: Construct sequential circuits such Flip flops , Shift registers and special type shift registers.</p> <p>CO5: Design synchronous and asynchronous counters, MOD N counter and Sequence generator.</p>

9	15MAT41	Engg. Mathematics - IV	<p>CO1:Apply various numerical methods to solve first order differential equation.</p> <p>CO2:Employ Bessel's and Legendre's differential equations to find the series solution.</p> <p>CO3:Apply the Cauchy-Riemann equations to find the analyticity of a function and determine poles and residues.</p> <p>CO4:To solve probabilistic of repeated nature and find the probability of joint probability distribution.</p> <p>CO5:To set the samples and use the knowledge of Markov chains in attempting engineering problems for feasible random events.</p>
10	15EC42	Microprocessor	<p>CO1: Explain the History of evolution of Microprocessors, Architecture of 8086, 8088, 8087, CISC &amp; RISC, Von-Neumann &amp; Harvard CPU architecture</p> <p>CO2: Write 8086 Assembly level programs using the 8086 instruction set</p> <p>CO3: Write modular programs using procedures and macros.</p> <p>CO4: Write 8086 Stack and Interrupts programming</p> <p>CO5:Interface 8086 to Static memory chips and 8255, 8254, 0808 ADC, 0800 DAC, Keyboard, Display and Stepper motors and INT 21 DOS interrupt</p>
11	15EC43	Control Systems	<p>CO1: Derive a mathematical model of a given system (physical, mechanical or electrical) represented through block diagram and signal flow graph</p> <p>CO2: Determine the behaviour of time response and steady state errors of I and II order systems for standard test input signals</p> <p>CO3: Analyze the stability of a system using numerical (Routh's -Hurwitz criteria) and graphical (root locus) approach</p> <p>CO4: Evaluate and Correlate the stability of a system using time and frequency responses</p> <p>CO5: Model a control system in continuous and discrete time using state variable technique</p>

12	15EC44	Signals & Systems	<p>CO1:Understand the mathematical description of continuous and discrete time signals and systems.</p> <p>CO2:Analyze the signals in time domain using convolution difference/differential equations</p> <p>CO3:Classify signals into different categories based on their properties.</p> <p>CO4:Analyze Linear Time Invariant (LTI) systems in time and transform domains.</p> <p>CO5:Build basics for understanding of courses such as signal processing, control system and communication.</p>
13	15EC45	Principles of Communication Systems	<p>CO1: Analyze and Compare modulation techniques such as AM, AM-DSBSC, SSB,VSB, FM and PM in time and Frequency domain.</p> <p>CO2: Demonstrate the generation and detection of AM and FM Wave.</p> <p>CO3:Derive functions like joint Probability, CDF, PDF, PSD,ConditionalProbability,moments,correlation for a given single or severalRandom Variables.</p> <p>CO4: Apply the concepts of Random Variables to Compare the performance of Analog Modulation techniques (AM, FM, DSB-SC) under a given Narrowband noisy signal environment.</p> <p>CO5:Realize the significance of pulse modulation Schemes (PAM, PPM, PWM) and line coding techniques with a digital communication context.</p>

14	15EC46	Linear Integration Circuits	<p>CO1: Acquire knowledge related to types of Opamp, basic concepts of Opamp, basic timer circuit of 555 Timer, operating principle of PLL, phase detectors/comparator, VCO and voltage regulators.</p> <p>CO2: Interpret the performance characteristics of practical Opamp considering various parameters like input output voltage range, CMRR, PSRR, Offset voltages and currents, Input/output Impedances, Slew rate and Frequency limitations.</p> <p>CO3: Solve problems related to Opamp characteristics and types of Opamp, PLL, VCO, ADC, DAC and 555 Timer.</p> <p>CO4: Analyze various applications of amplifier like DC and AC amplifiers, voltage and current sources, current amplifiers, instrumentation amplifiers, rectifiers, limiting circuits, clamping circuits, peak detectors, sample and hold circuits, V-I, I-V Converters, log and antilog amplifiers, multiplier and dividers, triangular/rectangular wave generators, Phase shift and Wein bridge oscillators, Differentiator and integrator, crossing detectors, inverting Schmitt trigger circuits, monostable and astable multivibrators, first and second order low pass and high pass active filters, Voltage regulators, 555 Timer as astable and monostable multivibrators, PLL, ADC and DAC.</p> <p>CO5: Apply the knowledge gained about amplifiers in the design of various practical circuits like DC and AC amplifiers, voltage and current sources, current amplifiers, instrumentation amplifiers, rectifiers, limiting circuits, clamping circuits, peak detectors, sample and hold circuits, V-I, I-V Converters, log and antilog amplifiers, multiplier and dividers, triangular/rectangular wave generators, Phase shift and Wein bridge oscillators, crossing detectors, inverting Schmitt trigger circuits, monostable and astable multivibrators, first and second order low pass and high pass active filters, Voltage regulators, 555 Timer as astable and monostable multivibrators, PLL, ADC and DAC.</p>
10	15ECL47	Microprocessors Lab	<p>CO1: Program a microprocessor to perform arithmetic, logical and data transfer applications</p> <p>CO2: Program a microprocessor to perform DOS interrupts, branch and loop operations</p> <p>CO3: Interface a microprocessor to various devices for simple applications.</p> <p>CO4: Perform string transfer, string reversing, searching a character in a string with string manipulation instructions of 8086.</p> <p>CO5: Utilize procedures and macros for modular programming.</p>

16	15ECL48	Linear IC's & Communication Lab	<p>CO1: Design Adder, Integrator, Differentiator circuits, Analog filters (2nd order LPF and HPF), OSCILLATORS (RC phase shift and Wein Bridge Oscillator), DAC and Instrumentation amplifier using op-amp <math>\mu A</math> 741 for a given design specification.</p> <p>CO2: Design and demonstrate the 555 timer operations in Astable &amp; Monostable configurations to generate signals/pulses for a given requirements.</p> <p>CO3: Demonstrate the analog modulation schemes (AM, FM and PAM) to realize the importance of modulation in analog communication systems.</p> <p>CO4: Demonstrate DSBSC generation using balance modulator IC 1496/1596 and frequency synthesis using phase locked loop.</p> <p>CO5: Design RF mixer using BJT/FET and appreciate the role of RF mixer in Superheterodyne Receivers.</p>
17	15ES51	Management and Entrepreneurship Development	<p>CO1: To recall and identify the relevance of management concepts &amp; its principles.</p> <p>CO2: To describe, discuss and relate management functions adopted within an organization.</p> <p>CO3: Realize the social responsibilities towards business and entrepreneurship</p> <p>CO4: To assess and modify different solution to small scale industries with the aid of financial institutions</p> <p>CO5: To demonstrate the Project Report, Appraisal and feasibility studies in the real world.</p>
18	15EC52	Digital Signal Processing	<p>CO1: Explain the frequency domain sampling and reconstruct discrete time signal.</p> <p>CO2: Compute DFT of a discrete time sequence using definition of DFT and properties.</p> <p>CO3: Evaluate Linear Convolution of Long input sequence and Impulse response using Overlap save and add methods.</p> <p>CO4: Develop FFT Algorithms to reduce the computation time of DFT</p> <p>CO5: Design Analog and Digital IIR Filters, FIR Filters using windowing techniques. Construct digital IIR and FIR filters in Direct form I, direct form II, Cascade, Parallel and Lattice Structures</p>

19	15EC53	Verilog HDL	<p>CO1: Differentiate between top-down and bottom-up digital design flow and list Verilog lexical conventions, data types, tasks and compiler directives as per the IEEE 1364-2001</p> <p>CO2: Given the specifications of a Combinational (or sequential) logic gate circuit, write a Verilog code, perform simulation and verify the functionality of the specified logic gate circuit.</p> <p>CO3: Given the logic gate circuit write Verilog code in gate, data flow, and behavioral modeling styles, and list the Verilog constructs used in these modelling styles as per the IEEE 1364-2001 Verilog standard.</p> <p>CO4: Write a test bench in Verilog for the specified digital logic circuit, verify the functionality of the logic circuit, and draw the waveforms.</p> <p>CO5: Contrast three different modeling styles using VHDL code for a given logic gate circuit( behavioral, structural and dataflow).</p>
20	15EC54	Information Theory & Coding	<p>CO1: Examine mathematically the performance parameters of the digital communication system (information system) to solve simple engineering problems related to it.</p> <p>CO2: Analyze statistical modeling of independent and dependent information sources (Ex: Markov Source) for the given specifications.</p> <p>CO3: Apply the basic rules and properties of coding for fundamental Source coding to encode the source output by constructing r-ary codes with the help of suitable optimum source coding algorithm (Shannon's encoding algorithm, Shannon-Fano and Huffman encoding algorithm, arithmetic coding, Lempel-Ziv and Run length coding) for the given specifications.</p> <p>CO4: Analyze the design aspects of communication channels (Continuous and Discrete Channel Modeling) in terms of channel capacity and entropy functions.</p> <p>CO5: Design Channel encoder and decoder using different error control coding schemes (Block codes and Convolutional Codes) and realize the importance of Error control coding in Communication systems.</p>

21	15EC553	Operating System	<p>CO1: Identify goals &amp; functions of operating system to achieve effective resource utilization. Classify Operating system into Batch processing, Multiprogramming, Time sharing, Real time and Distributed classes of operating system.</p> <p>CO2: Apply preemptive and non preemptive scheduling policies using Round Robin, Least completion time and First Come First Serve, Shortest request next policies.</p> <p>CO3: Identify advantages and disadvantages of contiguous and non contiguous memory allocation using paging and segmentation and Apply page replacement policies like least recently and first in first out.</p> <p>CO4: Organize file system and input output control system. Interpret file, directory and Its types and structure respectively.</p> <p>CO5: Analyze message passing and mailboxes with the issues of its naming and delivery of message and Deadlock detection algorithm and prevention in resource allocation.</p>
22	15EC562	Object Oriented Programming Using C++	<p>CO1. Understand the fundamental concepts of C++ language and write C++ Programs structure to solve the problems.</p> <p>CO2. Understand the functions and apply object oriented technique CLASS with array, pointers and functions to design C++ program for applications.</p> <p>CO3. Integrate constructors and destructors in the CLASS and apply operator overloading with constructors and destructors to implement processes to meet the desired specification of the project.</p> <p>CO4. Evaluate inheritance, virtual functions and polymorphism concepts in C++ program for the design of other software tools.</p> <p>CO5. Understand the file concepts and integrate all files with object oriented techniques to analyse the real world problems and design the project to solve it.</p>

23	15ECL57	DSP Lab	<p>CO1: Demonstrate sampling theorem and evaluate Impulse response of a given system</p> <p>CO2: Compute Linear and Circular convolution of two given sequences</p> <p>CO3: Evaluate Auto correlation and cross correlation of given sequences and verify their properties</p> <p>CO4: Draw Magnitude and frequency spectrum by computing N point DFT of a sequence</p> <p>CO5: Design FIR and IIR Filters. Implement FIR and IIR Filters to meet the given specifications</p>
24	15ECL58	HDL Lab	<p>CO1: Apply the Verilog HDL/VHDL constructs to model a list of combinational and sequential digital circuits in dataflow, behavioral or gate styles and simulate the same using Xilinx/Modelsim/Altera or any EDA tool.</p> <p>CO2: Write Synthesizable Verilog/VHDL codes to describe digital circuits and program FPGA/CPLD to experience the semi-custom VLSI design flow.</p> <p>CO3: Demonstrate the use of FPGA/CPLD to interface external peripherals such as stepper motor, LCD, DC Motors and validate the designs using appropriate apparatus (like oscilloscope) for the given specifications.</p> <p>CO4: Demonstrate the use of Verilog HDL/VHDL constructs to generate waveforms such as sine, triangular, square for the given specifications, and validate the same by interfacing DAC to FPGA/CPLD, and displaying on an oscilloscope.</p>
25	15EC61	Digital Communication	<p>CO1: Associate and apply the concepts of Bandpass sampling to well specified signals and channels</p> <p>CO2: Analyze and compute performance parameters and transfer rates for low pass and bandpass symbol under ideal and corrupted non band limited channels.</p> <p>CO3: Analyze symbol processing and performance parameters at the receiver under ideal and corrupted bandlimited channels</p> <p>CO4: Apply the concepts of spread spectrum modulation techniques for secure communication.</p>

26	15EC62	ARM Microcontroller & Embedded Systems	<p>CO1: Understand the architectural features and instruction set of 32-bit microcontroller ARM Cortex M3.</p> <p>CO2: Program ARM Cortex M3 using the various instructions and C language for different applications.</p> <p>CO3: Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.</p> <p>CO4: Develop the hardware software co-design and firmware design approaches.</p> <p>CO5: Explain the need of real time operating system for embedded system applications.</p>
27	15EC63	VLSI Design	<p>CO1: Interpret and understand of MOS transistor theory, CMOS fabrication flow and technology scaling.</p> <p>CO2: Make use of the basic gates using the stick and layout diagrams with the knowledge of physical design aspects</p> <p>CO3: Identify and understanding the concept of Memory elements along with timing considerations with scaling fundamentals</p> <p>CO4: Demonstrate the basic knowledge of FPGA based system design and Interpret testing and testability issues in VLSI Design</p> <p>CO5: Analyze the CMOS subsystems and architectural issues with the design constraints</p>
28	15EC64	Computer Communication Networks	<p>CO1: Identify the networking components such as switches, hubs, routers etc. Explain the concepts of wireless and wired network structures. Identify the best models for media access control; calculate the performance parameters, such as delay, throughput, efficiency, shortest path, etc, associated with media access control protocols</p> <p>CO2: Provide efficient solutions to mitigate the issues associated with network layer and transport layer services such as flow control, addressing, congestion control, addressing, routing etc. For undergraduates, this is achieved by comparing and contrasting various features and limitations of several protocols Analyse the given real life problem in networking domain and solve that problem using analytical solutions or simulations</p> <p>CO3: Analyse the given real life problem in networking domain and solve that problem using analytical solutions or simulations</p>

29	15EC653	Artificial Neural Networks	<p>C315.1: Illustrate the artificial neuron model and network through metaphorical biological neuron, analyze linear and non-linear separable problems using XOR problem and derive perceptron learning algorithm.</p> <p>C315.2: Interpret Perceptron, Mean Squared Error and Gradient Descent algorithm Derive weight update equation for multilayer neural network using Back propagation algorithm and its practical considerations.</p> <p>C315.3: Analyze the learning law in Support vector machine and the Radial bases function networks.</p> <p>C315.4: Illustrate the learning laws of self organizing feature map.</p>
30	15EC661	Data Structures Using C++	<p>CO1. Identify the different types of datastructures ,linear and nonlinear and understand dynamic memory allocations,STL for the representation of datastructure.</p> <p>CO2. Demonstrate the datastructures arrays,stacks,matrix and their applications to solve problems.</p> <p>CO3. Analyse the queus and dictionary datastructure to implement them in applications.</p> <p>CO4. Analyse nonlinear datastructures,binary tress and its operations.</p> <p>CO5. Outline the importance of binary search ,trees with their operations and understand sorting techniques Heap datastructure.</p>
31	15ECL67	Embedded Controller Lab	<p>CO1: Understand the instruction set of 32-bit microcontroller ARM Cortex M3 and the software tool required for programming in Assembly and C language.</p> <p>CO2: Develop assembly language programs using ARM Cortex M3 for different applications</p> <p>CO3: Interface external devices and I/O with ARM Cortex M3</p> <p>CO4:Develop C language programs and library functions for embedded system applications</p> <p>CO5:Develop Real Time Applications using Cortex M3</p>

32	15ECL68	Computer Network Lab	<p>CO1: Demonstrate the understanding of computer networking concepts through design, development and simulations</p> <p>CO2: Apply the knowledge acquired on the subject computer networking in solving problems such as physical layer errors, data flow problem at data link layer, congestion control at transport layer</p> <p>CO3: Create network scenarios using network simulators to study the behaviour of various networking protocols of TCP/IP protocol</p> <p>CO4: Study the performance of a Wireless Networks for different network conditions.</p>
33	15EC71	Microwave & Antennas	<p>CO1: Describe the use and advantages of microwave transmission</p> <p>CO2: Analyze various parameters related to microwave transmission lines and waveguides</p> <p>CO3: Identify microwave devices for several applications</p> <p>CO4: Analyze various antenna parameters necessary for building an RF system</p> <p>CO5: Recommend various antenna configurations according to the applications</p>
34	15EC72	Digital Image Processing	<p>CO1 : Illustrate image formation and the role of human visual system plays in perception of gray and color image data</p> <p>CO2 : Apply image processing enhancement techniques in both spatial and frequency(Fourier) domain</p> <p>CO3 : Distinguish restoration in presence of noise in doth spatial and frequency domain</p> <p>CO4 : Evaluate color models and morphological image processing</p> <p>CO5 : Analyze image segmentation, representation and boundary descriptors</p>

35	15EC73	Power Electronics	<p>CO1: Acquire the knowledge about structure, switching, control characteristics of various power devices and identify the various applications associated with it.</p> <p>CO2: Describe two transistor model of SCR and analyze various triggering circuits used for different semiconductor switches.</p> <p>CO3: Design and analyze various controlled rectifier circuits and learnt to select Suitable power electronic devices as per the requirements</p> <p>CO4: Design and analyze various ac voltage controller circuits and learnt to select Suitable power electronic devices as per the requirements.</p> <p>CO5: Formulate &amp; analyze operation of dc choppers, inverters, different types of static switches and assess the performance</p>
36	15EC743	Real Time Systems	<p>CO1: Classify various Real time systems</p> <p>CO2: Explain the concepts of computer control,</p> <p>CO3: Explain the concepts of operating system and the suitable computer hardware requirements for real-time applications.</p> <p>CO4: Asses the software languages to meet Real time applications.</p> <p>CO5: Apply suitable methodologies to design and analyze Real-Time Systems.</p>
37	15EC751	DSP Algorithms & Architecture	<p>CO1: Comprehend the knowledge and concepts of digital signal processing techniques.</p> <p>CO2: Apply the knowledge of DSP computational building blocks to achieve speed in DSP architecture or processor.</p> <p>CO3: Apply knowledge of various types of addressing modes, interrupts, peripherals and pipelining structure of TMS320C54xx processor.</p> <p>CO4: Develop basic DSP algorithms using DSP processors.</p> <p>CO5: Discuss about synchronous serial interface and multichannel buffered serial port (McBSP) of DSP device and demonstrate the programming of CODEC interfacing</p>

38	15ECL76	Advanced Communication Lab	<p>CO1: Design &amp; Demonstrate generation and detection of Digital Modulation Schemes and TDM.</p> <p>CO2:Determine the characteristics and response of Microwave devices and Optical wave guide</p> <p>CO3: Determine the characteristics of Micro strip antenna and compute the associated parameters .</p> <p>CO4: Measure Frequency, Wavelength, Power and Attenuation of Klystron Bench</p> <p>CO5: Simulate the Digital Modulation Scheme &amp; line Codes with display of waveform.</p>
39	15ECL77	VLSI Lab	<p>CO1: Demonstrate the behavior of basic gates, buffer and transmission gate using Verilog coding.</p> <p>CO2: Realize the operation of flip-flops, adders, counters and SAR and verify the results.</p> <p>CO3 Design and draw Schematic, layout and verify LVS, DC and transient analysis of a CMOS Inverter.</p> <p>CO4 Design and draw Schematic, layout and verify DC, AC and transient analysis of CMOS differential amplifier, common source amplifier, common drain amplifier.</p> <p>CO5 Design and draw Schematic, layout and verify the simulation results of R-2R DAC, Op-Amp and SAR CMOS NAND and NOR gates.</p>
40	15EC81	Wireless Cellular& LTE 4G Broadband	<p>CO1. Appraise the historical evolution of cellular wireless technologies and identify the significance of different organizations/regulatory bodies across the world and the key technological enablers of LTE.</p> <p>CO2. Identify the essential wireless networking &amp; communication technologies behind the LTE and related practical implementation challenges considering both uplink and downlink channels.</p> <p>CO3. Analyze air interface protocol, channel structure and related layer features for both downlink and uplink channels in the LTE standard.</p>

41	15EC82	Fiber Optics & Networks	<p>CO1:Classification and working of optical fiber with different modes of signal propagation.</p> <p>CO2:Describe the transmission characteristics and losses in optical fiber communication. transmission lines and waveguides</p> <p>CO3:Describe the construction and working principle of optical connectors, multiplexers and amplifiers. requirements for real-time applications.</p> <p>CO4:Describe the constructional features and the characteristics of optical sources and detectors.</p> <p>CO5:Illustrate the networking aspects of optical fiber and describe various standards associated with it.</p>
42	15EC833	Radar Engineering	<p>CO1: Demonstrate the understanding of the radar fundamentals, radar signals, Radar operating frequencies and its applications.</p> <p>CO2: Analyze the modified Radar range equation for the prediction of range performance and the detection of target signal in a noisy environment.</p> <p>CO3: Analyze the working principle of MTI and Doppler radar with its design considerations and relate the importance of microwave engineering and digital signal processing in the growth of RADAR technology.</p> <p>CO4: Compare Monopulse tracking and sequential lobing Radar tracking systems.</p> <p>CO5: Apply the fundamental knowledge of Antenna theory and communication systems for the parametric study of Radar subsystems, which includes Radar antenna, Radar Receiver, Duplexers, Receiver Protectors and Radar Displays.</p>
43	15EC84	Internship/Professional Practice	<p>CO1: Design Project-related skills to develop a project</p> <p>CO2:Develop Employability enhancing activities</p> <p>CO3: Develop Professional behavior Onsite</p> <p>CO4:Develop their Communication skills</p>
44	15ECP85	Project Work	<p>CO1: Identify an Engineering problem and find appropriate solution for it.</p> <p>CO2: Design a project for current industrial standards</p> <p>CO3: implement project work in laboratory and industrial site</p> <p>CO4: Evaluate knowledge of contemporary issues and able to apply effectively for project management</p>

45	15ECS86	Seminar	<p>CO1: Students will better understand the role that effective presentations have in public/professional contexts and gain experience in formal/ informal presentation</p> <p>CO2: Students will demonstrate the ability to discern the assignment's intended audience and objectives and respond appropriately</p> <p>CO3: Students will be able to construct a paper consistent with expectations of the discipline, including an appropriate organization, style, voice and tone</p> <p>CO4: Students will be able to access information in a variety of ways appropriate to a discipline, including locating and using library collections and services and other search tools and databases and collaborate to work on intellectual projects.</p>
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