



**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**  
**2015 SCHEME CO's**

Course Code	Course Name	CO Code	CO
15MAT31	ENGINEERING MATHEMATICS - 3	CO1	Know the use of periodic signals and Fourier series to analyze circuits and system communication.
		CO2	Explain the general linear system theory for continuous-time signals and digital signal processing using the Fourier transforms and Z-transform.
		CO3	Employ appropriate Numerical methods to solve algebraic and transcendental equations.
		CO4	Apply Greens theorem, Divergence theorem and Stokes theorem in various applications in the field of elector-magnetic and gravitational fields and fluid flow problems.
		CO5	Determine the externals of functionals and solve the simple problems of the calculus of variations.
15EC32	Analog Electronics	CO1	Acquire knowledge of Working principles, characteristics and basic applications of BJT and FET
		CO2	Acquire knowledge of Single stage, cascaded and feedback amplifier configurations.
		CO3	Acquire knowledge of Frequency response characteristics of BJT and FET. Analyse the performance of FET amplifier in CS configuration.
		CO4	Acquire knowledge of Power amplifier classifications such as Class A, Class B, etc.
		CO5	Analyse the performance of Power Amplifiers and Oscillator circuits. Analyse the Interpretation of performance characteristics of transistors amplifiers, frequencyResponse and Oscillators.
15EC33	Digital Electronics	CO1	Acquire knowledge of <ul style="list-style-type: none"> <li>o Combinational Logic.</li> <li>o Simplification Techniques using Karnaugh Maps, Quine-Mc Clusky Technique.</li> <li>o Operation of Decoders, Encoders, Multiplexers, Adders and Subtractors.</li> </ul>
		CO2	Acquire knowledge of <ul style="list-style-type: none"> <li>o Working of Latches, Flip-Flops,</li> <li>o Designing Registers, Counters.</li> <li>o Mealy, Moore Models and State Diagrams</li> </ul>
		CO3	Analyse the performance of Simplification Techniques using Karnaugh Maps, Quine-Mc Clusky Technique & Synchronous Sequential Circuits.
		CO4	Design and Develop Mealy and Moore Models for digital circuits.
		CO5	Apply the knowledge gained in the design of Counters and Registers.
15EC34	NETWORK ANALYSIS	CO1	Acquire knowledge for solving problems related to Series and Parallel combination of Passive Components, Source Transformation and Source Shifting.
		CO2	Acquire knowledge for solving problems related to Network Theorems and Electrical laws to reduce circuit complexities and to arrive at feasible solutions.
		CO3	Acquire knowledge for solving problems related to Various Two port Parameters and their Relationship for finding Network Solutions.
		CO4	Analyze the Performance of various Types of Networks Using different concepts and principles
		CO5	Apply Laplace transform method to solve Networks
15EC35	Electronic Instrumentation	CO1	Define and Describe accuracy and precision, types of errors, statistical and probability analysis
		CO2	Describe basic functional concepts of various analog and digital measuring Instruments
		CO3	Describe basic concepts of Microprocessor based instruments.
		CO4	Describe and discuss functioning and types of oscilloscopes and signal generators, AC and DC bridges
		CO5	Recognize and describe significance and working of different types of transducers.
15EC36	ENGINEERING ELECTROMAGNETICS	CO1	Define and Describe Coluomb's law and electric field intensity
		CO2	Define and Explain electric flux density, Gauss's law and divergence.



**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**  
**2015 SCHEME CO's**

		CO3	Describe energy and potential along with concepts of current and conductors. Describe the concepts of time varying fields and Develop Maxwell's equations in Point and Integral Forms
		CO4	Define and Describe basic concepts of Magnetostatics by studying the various laws,Stoke's Theorem and scalar and vector magnetic flux density
		CO5	Explain Magnetic Forces, Materials and Inductance. Describe and Compare Different Types of Wave Propagation
15ECL37	Analog Electronics lab	CO1	Design and Test rectifiers, clipping circuits, clamping circuits and voltage regulators.
		CO2	Compute the parameters from the characteristics of JFET and MOSFET devices
		CO3	Design, test and evaluate BJT amplifiers in CE configuration
		CO4	Design and Test JFET/MOSFET amplifiers& power amplifier.
		CO5	Design and Test various types of oscillators.
15ECL38	Digital Electronics Lab	CO1	Demonstrate the truth table of various expressions and combinational circuits using logic gates.
		CO2	Design, test and evaluate various combinational circuits such as adders,subtractors, comparators, multiplexers and demultiplexers
		CO3	Construct flips-flops, counters and shift registers.
		CO4	Simulate full adder.
		CO5	Simulate up/down counters.
15MAT41	ENGINEERING MATHEMATICS-4	CO1	Solve first and second order ordinary differential equations arising in flow problems using single step and multistep numerical methods. Draw the validity of the hypothesis proposed for the given sampling distribution in accepting or rejecting the hypothesis.
		CO2	Understand the analyticity, potential fields, residues and poles of complex potentials in field theory and electromagnetic theory. Determine joint probability distributions and stochastic matrix connected with the multivariable correlation problems for feasible random events
		CO3	Describe conformal and bilinear transformation arising in aerofoil theory, fluid flow visualization and image processing.
		CO4	Solve problems of quantum mechanics, hydrodynamics and heat conduction by employing Bessel's function relating to cylindrical polar coordinate systems and Legendre's polynomials relating to spherical polar coordinate systems
		CO5	Solve problems on probability distributions relating to digital signal processing, information theory and optimization concepts of stability of design and structural engineering. Define transition probability matrix of a Markov chain and solve problems related to discrete parameter random process.
15EC42	MICROPROCESSORS	CO1	Write programs to run on 8086 Microprocessors based systems.
		CO2	Design system using memory chips and peripheral chips for 16 Bit 8086 microprocessors.
		CO3	Interface various peripherals to 8086. Understand the features of high speed buses and higher bit processors.
		CO4	Write modular programs using procedures and macros.
		CO5	Write 8086 programs interleaved with 8087 instructions. Describe the architecture physical and logical configurations of memory register organization and addressing modes and machine language instruction formats.
15EC43	CONTROL SYSTEMS	CO1	Develop the mathematical model of mechanical and electrical Systems.
		CO2	Understand time domain specifications for first and second order systems. Represent a set of algebraic equations by block diagram and signal flow graphs and determine specified transfer functions from block diagrams.
		CO3	Determine the stability of a system in the time domain using Route Harvitz criteria and root locus technique.
		CO4	Determine the stability of a system in the frequency domain



**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**  
**2015 SCHEME CO's**

			using Nyquist and bode plots.
		CO5	Model a control system in continuous and discrete time using state variable techniques. Analyze and design of discrete systems in state variable analysis.
15EC44	Signals and Systems	CO1	Understand mathematical description and representation of continuous and discrete time signals and systems.
		CO2	Characterize and classify CT and DT systems based on the properties.
		CO3	Develop input output relationship for linear shift invariant system and understand the convolution operator for continuous and discrete time system.
		CO4	Understand and resolve the signals in frequency domain using Fourier series and Fourier transforms. Understand the process of sampling and effect of under sampling
		CO5	Understand the basic concept of Z-transform and to develop the ability to analyze system in Z transform. Invert Z-transform by power-series expansion and/or Partial Fraction Expansion.
15EC45	PRINCIPLES OF COMMUNICATION SYSTEMS	CO1	Determine the performance of analog modulation schemes in time and frequency domains.
		CO2	Determine the performance of systems for generation and detection of modulated analog signals.
		CO3	Characterize analog signals in time domain as random processes and in frequency domain using Fourier transforms.
		CO4	Characterize the influence of channel on analog modulated signals. Determine the performance of analog communication systems.
		CO5	Understand the characteristics of pulse amplitude modulation, pulse position modulation and pulse code modulation systems. Calculate the bandwidth and power Requirements for Analog System
15EC46	LINEAR INTEGRATED CIRCUITS	CO1	Explain Op-Amp circuit and parameters including CMRR, PSRR, Input & Output Impedances and Slew Rate
		CO2	Design Op-Amp based Inverting, Non-inverting, Summing & Difference Amplifier. Design first & Second Order Low Pass, High Pass, Band Pass, Band Stop Filters and Voltage Regulators
		CO3	Design Op-Amp based AC Amplifiers including Voltage Follower, Inverting / Non-inverting & Difference Amplifier
		CO4	Develop circuits for Op-Amp based Voltage / Current Sources & Sinks, Current, Instrumentation and Precision Amplifiers. Explain applications of linear ICs in phase detector, VCO, DAC, ADC and Timer
		CO5	Develop circuits for Op-Amp based linear and non-linear circuits comprising of limiting, clamping, Sample & Hold, Differentiator / Integrator Circuits, Peak Detectors, Oscillators and Multiplier & Divider
15ECL47	MICROPROCESSOR OR LABORATORY	CO1	Write and execute 8086 assembly level programs to perform data transfer, arithmetic and logical operations
		CO2	Understand assembler directives, branch, loop operations and DOS 21H Interrupts.
		CO3	Write and execute 8086 assembly level programs to sort and search elements in a given array.
		CO4	Perform string transfer, string reversing, searching a character in a string with string manipulation instructions of 8086.
		CO5	Utilize procedures and macros in programming 8086
15ECL48	LIC LAB	CO1	Gain hands-on experience in building analog systems for a given specification using the basic building blocks.
		CO2	Gain hands-on experience in AM and FM techniques, frequency synthesis.
		CO3	Gain the hands- on experience in pulse and flat top sampling techniques.



**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**  
**2015 SCHEME CO's**

		CO4	Make the right choice of an IC and design the circuit for a given Application. Understand the applications of linear IC for addition, integration and 555 timer operation to generate signals/pulses
		CO5	Design and analyze the performance of instrumentation amplifier, LPF, HPF, DAC and oscillators using linear IC.
15EC51	Management & Entrepreneurship Development	CO1	Understand the fundamental concepts of Management and Entrepreneurship
		CO2	Select a best Entrepreneurship model for the required domain of establishment
		CO3	Describe the functions of Managers, Entrepreneurs and their social responsibilities
		CO4	Compare various types of Entrepreneurs
		CO5	Analyze the Institutional support by various state and central government agencies
15EC52	Digital Signal Processing	CO1	Determine response of LTI systems using time domain and DFT techniques
		CO2	Compute DFT of real and complex discrete time signals
		CO3	Computation of DFT using FFT algorithms and linear filtering approach
		CO4	Digital IIR filter design and realize using digital computations.
		CO5	Digital FIR filter design and realize using digital computations.
15EC53	Verilog HDL	CO1	Define and describe digital design flows for system design and recognise the trade-offs involved in different approaches and to describe digital circuits utilizing various constructs of Verilog.
		CO2	Explain syntax, lexical conventions, data types, modules and ports
		CO3	Write Verilog programs in gate and dataflow (RTL) levels of Abstraction.
		CO4	Model the digital system using behavioral description.
		CO5	Analyze the steps involved in synthesis of HDL code to write simple programs in VHDL in different styles.
15EC54	Information Theory & Coding	CO1	Explain concept of Dependent & Independent Source, measure of information, Entropy, Rate of Information and Order of a source
		CO2	Represent the information using Shannon Encoding, Shannon Fano, Prefix and Huffman Encoding Algorithms
		CO3	Model the continuous and discrete communication channels using input, output and joint probabilities
		CO4	Determine a codeword comprising of the check bits computed using Linear Block codes, cyclic codes & convolutional codes
		CO5	Design the encoding and decoding circuits for Linear Block codes, cyclic codes, convolutional codes, BCH and Golay codes.
15EC553	Operating Systems	CO1	Explain the goals, structure, operation and types of operating systems
		CO2	Apply scheduling techniques to find performance factors.
		CO3	Explain organization of file systems and IOCS.
		CO4	Apply suitable techniques for contiguous and non-contiguous memory allocation.
		CO5	Describe message passing, deadlock detection and prevention methods
15EC563	Microcontroller	CO1	Explain the difference between Microprocessors & Microcontrollers, Architecture of 8051 Microcontroller, Interfacing of 8051 to external memory and Instruction set of 8051.
		CO2	Write 8051 Assembly level programs using 8051 instruction set.
		CO3	Explain the Interrupt system, operation of Timers/Counters and Serial port of 8051.
		CO4	Write 8051 Assembly language program to generate timings and waveforms using 8051 timers, to send & receive serial data using 8051 serial port and to generate an external interrupt using a switch.
		CO5	Write 8051 C programs to generate square wave on 8051 I/O port pin using interrupt and to send & Interface simple switches, simple LEDs, ADC 0804, LCD and Stepper Motor to 8051 using 8051 I/O ports. receive serial data using 8051 serial port.
15ME563	Automation & Robotics	CO1	Classify various types of automation & manufacturing systems
		CO2	Discuss different robot configurations, motions, drive systems and its performance parameters.
		CO3	Describe the basic concepts of control systems, feedback components, actuators and power transmission systems used in robots
		CO4	Explain the working of transducers, sensors and machine vision systems
		CO5	Discuss the future capabilities of sensors, mobility systems and Artificial Intelligence in the field of



**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**  
**2015 SCHEME CO's**

			robotics.
15ECL57	15ECL57-DSP LAB	CO1	Understand the concepts of analog to digital conversion of signals and frequency domain sampling of signals.
		CO2	Modeling of discrete time signals and systems.
		CO3	verification of DSP properties and results.
		CO4	Implementation of discrete computations using DSP processor and verify the results.
		CO5	Realize the digital filters using a simulation tool and a DSP processor and verify the frequency and phase response.
15ECL58	15ECL58-HDL LAB	CO1	Write VHDL programs to simulate Combinational circuits in Dataflow, Behavioral and Gate level Abstractions and Synthesize Combinational circuits on programmable ICs and test the hardware.
		CO2	Describe sequential circuits like flip flops in Behavioral description and obtain simulation waveforms, Synthesize Sequential circuits on programmable ICs and test the hardware.
		CO3	Write Verilog programs to simulate Combinational circuits in Dataflow, Behavioral and Gate level Abstractions and Synthesize Combinational circuits on programmable ICs and test the hardware.
		CO4	Describe sequential circuits like Counters in Behavioral description and obtain simulation waveforms, Synthesize Sequential circuits on programmable ICs and test the hardware.
		CO5	Interface the hardware to the programmable chips and obtain the required output.
15EC61	DIGITAL COMMUNICATION	CO1	Analyze the performance of a baseband and pass band Digital communication system in terms of error rate & spectral efficiency.
		CO2	Perform the time & frequency domain analysis of the signals in a Digital communication system.
		CO3	Select the blocks in a design of Digital Communication System.
		CO4	Analyze error performance of a Digital Communication System in presence of noise & other interferences
		CO5	Analyze the performance of spread spectrum communication system.
15EC62	ARM MICROCONTROLLER & EMBEDDED SYSTEMS	CO1	Describe the applications and architectural features 32 bit microcontroller ARM Cortex M3.
		CO2	Apply the knowledge gained for Programming ARM Cortex M3 for different applications.
		CO3	Understand the basic hardware components and their selection method based on the characteristics and attributes of an embedded system.
		CO4	Develop the hardware /software co-design and firmware design approaches.
		CO5	Explain the need of real time operating system for embedded system applications.
15EC63	VLSI DESIGN	CO1	Draw the basic gates using the stick and layout diagrams with the knowledge of physical design aspects.
		CO2	Demonstrate Scaling of MOS Circuits, subsystem design Process.
		CO3	Demonstrate knowledge of FPGA based system design, Analyze CMOS subsystems and architectural issues with the design constraints
		CO4	Interpret testing and testability issues in VLSI Design , Interpret Memory elements along with timing considerations
		CO5	Demonstrate understanding of MOS transistor theory, CMOS fabrication flow and technology .
15EC64	COMPUTER COMMUNICATION NETWORK	CO1	Describe the layering architecture of computer networks and distinguish between the OSI reference model and TCP/IP protocol suite. Identify the protocols and services of Data link layer-DLC layer Protocols .
		CO2	Identify the protocols and services of Data link Layer -MAC Layer Protocols, Wired Ethernet LANs .
		CO3	Distinguish the basic network configurations and standards associated with each network.
		CO4	Construct a network model and determine the routing of packets using different routing algorithm.
		CO5	Identify the protocols and functions associated with the transport layer services.
15EC654	DIGITAL SWITCHING SYSTEMS	CO1	Describe the electromechanical switching systems and its comparison with the digital switching.
		CO2	Describe the Evaluation of digital Switching systems and its functions.
		CO3	Determine the telecommunication traffic and its measurements.
		CO4	Define the technologies associated with the data switching operations and the software aspects of switching systems.
		CO5	Describe the maintenance of the switching systems and its generics.



**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**  
**2015 SCHEME CO's**

15EC661	15EC661-DATA STRUCTURES USING C++	CO1	Acquire knowledge of Dynamic memory allocation, Various types of data structures, operations and algorithms
		CO2	Analyze the operations of Linear Data structures: Arrays, Matrices & stacks and their applications
		CO3	Analyze the operations of Linear Data structures: Queues and Hashing and their applications
		CO4	Understand non Linear data structures trees and operations
		CO5	Analyze Priority queues and binary search trees
15EC663	DIGITAL SYSTEM DESIGN USING VERILOG	CO1	Describe how analog signals are used to represent digital values in different logic families, including characterization of the noise margins, timing constraints. Implementation and Verification of combinational circuits.
		CO2	Study the design and operation of basic functional concepts of various types of memories.
		CO3	Describe the concepts of IC's and Programmable Logic Devices.
		CO4	Design and diagnosis of various I/O interfacing concepts.
		CO5	Describe various design methodology.
15ECL67	15ECL67- EMBEDDED CONTROLLER LAB	CO1	Understand the instruction set of 32 bit microcontroller ARM Cortex M3. Develop assembly language programs using ARM Cortex M3 for different Applications.
		CO2	Understand the operation of DC and stepper motor and control the speed and direction.
		CO3	Interface keypad and seven segment display.
		CO4	Develop C language programs to control UART,ADC and DAC operation.
		CO5	Understand the operation of interrupts, PWM and other IO Devices.
15ECL68	15ECL68- COMPUTER NETWORKS LAB	CO1	Use the network simulator to understand the fundamental underlying principles of network topologies.
		CO2	Use the network simulator to analyse the performance parameters of the network with different configurations.
		CO3	Use the network simulator/Using C/C++ to implement the routing protocols
		CO4	Use C/C++ to describe the functionality of layered network architecture for framing and error control.
		CO5	Use C/C++ to implement the transport and Congestion protocols.
15EC71	Microwave & Antennas	CO1	Describe the use and advantages of Microwave Transmission.
		CO2	Analyze various parameters related to microwave transmission lines and waveguides.
		CO3	Identify Microwave Devices for several applications.
		CO4	Analyze various antenna parameters necessary for building an RF system.
		CO5	Recommend various antenna configurations according to the applications.
15EC72	Digital Image Processing	CO1	Understand image formation and the role human visual system plays in perception of gray and colour image data.
		CO2	Apply image processing enhancement techniques in both the spatial and frequency (Fourier)domains.
		CO3	Understand the colour image processing, wavelets and the approaches of morphological image processing.
		CO4	Understand the image restoration techniques in digital image processing
		CO5	Design image analysis techniques in the form of image segmentation and to evaluate the Methodologies for segmentation,understanding the image representation & descriptors.
15EC73	Power Electronics	CO1	Describe the characteristics of different power devices and identify the various applications associated with it.
		CO2	Illustrate the working of power circuit as DC-DC converter.
		CO3	Illustrate the operation of inverter circuit and static switches.
		CO4	Determine the output response of a thyristor circuit with various triggering options.
		CO5	Determine the response of controlled rectifier with resistive and inductive loads.
15EC741	Multimedia Communication	CO1	Understand basics of different multimedia networks and applications.
		CO2	Understand different compression techniques to compress audio and video
		CO3	Describe multimedia Communication across Networks.
		CO4	Analyse different media types to represent them in digital form.
		CO5	Compress different types of text and images using different compression techniques and analyse DMS.



**DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING**  
**2015 SCHEME CO's**

15EC751	DSP Algorithms & Architecture	CO1	Comprehend the knowledge and concepts of digital signal processing techniques
		CO2	Apply the knowledge of DSP computational building blocks to achieve speed in DSP architecture or processor
		CO3	Apply knowledge of various types of addressing modes, interrupts, peripherals and pipelining structure of TMS320C54xx processor
		CO4	Develop basic DSP algorithms using DSP processors.
		CO5	Discuss about synchronous serial interface, programming of CODEC interfacing and multichannel buffered serial port (McBSP) of DSP device
15EC752	IOT and Wireless Sensor Networks	CO1	Describe the OSI Model for the IoT/M2M systems.
		CO2	Understand the architecture and design principles for IoT.
		CO3	Learn the programming for IoT Applications.
		CO4	Understand basic sensor network concepts and network architecture
15ECL76	15ECL76-Advanced Communication Lab	CO5	Identify the communication protocols which best suits the WSNs.
		CO1	Analyze the performance of a Time Division Multiplexing & Digital Modulation Techniques.
		CO2	Perform Theoretical & Practical analysis of Microwave Test bench and Microwave Passive devices.
		CO3	Select the blocks in a design of Optical fibre Communication System.
		CO4	Analyse the performance parameters of Antennas.
15ECL77	15ECL77-VLSI Lab	CO5	Simulate Digital Data Formats and Transmitter & Digital Modulation Techniques.
		CO1	Write test bench to simulate various digital circuits.
		CO2	Interpret concepts of DC Analysis, AC Analysis and Transient Analysis in analog circuits.
		CO3	Design and simulate basic CMOS circuits like inverter, common source amplifier and differential amplifiers.
15EC81	Wireless Cellular and LTE 4G Broad Band	CO4	Use basic amplifiers and further design higher level circuits like operational amplifier and analog/digital converters to meet desired parameters.
		CO1	Describe OFDM Modulation System
		CO2	Compare different technologies used for wireless communication systems.
		CO3	Understand the system architecture and the functional standard specified in LTE 4G
		CO4	Demonstrate the UTRAN and EPS handling processes from set up to release including mobility management for a variety of data call scenarios
15EC82	Fiber Optics and Networks	CO5	Evaluate the performance of resource management and packet data processing and transports algorithms
		CO1	Classification and working of optical fiber with different modes of signal propagation.
		CO2	Describe the transmission characteristics and losses in optical fiber communication.
		CO3	Describe the constructional features and the characteristics of optical sources and detectors
		CO4	Describe the construction and working principle of optical connectors, multiplexers and amplifiers.
15EC833	Radar Engineering	CO5	Illustrate the networking aspects of optical fiber and describe various standards associated with it.
		CO1	Understand the Radar fundamentals & radar signals. Pulsed Radar Block diagram & its applications.
		CO2	Understand the predictions of Radar range performance, & other parameters.
		CO3	Explain the working principle of Pulsed Doppler Radars, their applications and limitations.
		CO4	Analyze the range parameters of pulsed radar system which affect the system performance.
15EC835	Network and Cyber Security	CO5	Describe the working of various Radar transmitters & receivers.
		CO1	Identify threats to network security and various protocols employed to secure network.
		CO2	Understand the security concerns in Email, functionality & role of S/MIME and DKIM.
		CO3	Deliberate the Overview of IP Security, Internet Key Exchange and discuss the alternatives for combining security associations and cryptographic suites approved for use with IPsec.
		CO4	Understand the basic concepts of cyber security and discuss the cyber security problems.
		CO5	Learn the details of Enterprise Security Framework and apply concept of cyber security framework in computer system administration.