



**MALLAREDDY ENGINEERING COLLEGE AND MANAGEMENT SCIENCES**  
(Approved by AICTE New Delhi & Affiliated to JNTU Hyderabad)

**Kistapur Village, Medchal, Medchal District-501401**

DEPT. OF ELECTRONICS & COMMUNICATION ENGINEERING						
R-16 REGULATION - COURSE OUTCOMES						
S. No	CLASS	REGULATION	Subject	Course Code	CO's	Course Outcomes
1	I/I	R-16	MATHEMATICS –I	MA101BS	CO-1	Write the matrix representation of a set of linear equations and to analyze the solution
					CO-2	Find the Eigen values and Eigen vectors which come across under linear transformations
					CO-3	Find the extreme values of functions of two variables with/ without constraints.
					CO-4	Identify whether the given first order DE is exact or not
					CO-5	Solve higher order DE's and apply them for solving some real world problems
2	I/I	R-16	Engineering Chemistry	CH102BS	CO-1	The basic knowledge of electrochemical procedures related to corrosion and its control.
					CO-2	They can understand the basic properties of water and its usage in domestic and industrial purposes.
					CO-3	They learn the use of fundamental principles to make predictions about the general properties of materials.
					CO-4	They can predict potential applications of chemistry and practical utility in order to become good engineers and entrepreneurs.
					CO-5	They know the advantages, classification and constituents of composites.
3	I/I	R-16	Engineering Physics-I	PH103BS	CO-1	Realize the importance of light phenomena in thin films and resolution.
					CO-2	Learn principle, working of various laser systems and light propagation through optical fibers.
					CO-3	Distinguish various crystal systems and understand atomic packing factor.
					CO-4	To understand various crystal systems and there structures elaborately.
					CO-5	Know the various defects in crystals.
4	I/I	R-16	Professional Communication in English	EN104HS	CO-1	Use English Language effectively in spoken and written forms.
					CO-2	Comprehend the given texts and respond appropriately.
					CO-3	Communicate confidently in formal and informal contexts.
					CO-4	Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
					CO-5	Apply new oral vocabulary words in context to reinforce meaning.
5	I/I	R-16	Engineering Mechanics	ME105ES	CO-1	To understand the resolving forces and moments for a given force system
					CO-2	To analyze the types of friction for moving bodies and problems related to friction.
					CO-3	To determine the centroid and second moment of area
					CO-4	To determine Mass moment of inertia of composite bodies.
					CO-5	Find the value of Energy gap and Hall coefficient of a given semiconductor material.
6	I/I	R-16	Basic Electrical and Electronics	EE106ES	CO-1	To analyze and solve electrical circuits using network laws and theorems.
					CO-2	To identify and characterize diodes and various types of transistors.
					CO-3	To understand working principle, operation of transformers and its types.

			Engineering		CO-4	To study the working principles of Electrical Machines.
					CO-5	To introduce components of Low Voltage Electrical installations and gain the knowledge on batteries and Protective Equipments.
7	I/I	R-16	English Language Communication Skills Lab	EN107HS	CO-1	Better understanding of nuances of English language through audio- visual experience and group activities
					CO-2	Neutralization of accent for intelligibility
					CO-3	Speaking skills with clarity and confidence which in turn enhances their employability skills.
					CO-4	Neutralization of accent for intelligibility
					CO-5	Understand and apply knowledge of human communication and language process.
8	I/I	R-16	Engineering Workshop	ME108ES	CO-1	Study and practice on machine tools and their operations
					CO-2	Practice on Tin-Smithy and Development of jobs carried out and soldering
					CO-3	Practice on manufacturing of components using workshop trades including plumbing, fitting, carpentry, foundry, house wiring and welding
					CO-4	Identify and apply suitable tools for different trades of Engineering processes including drilling, material removing, measuring, chiseling.
					CO-5	Apply basic electrical engineering knowledge for house wiring practice.
9	I/II	R-16	Engineering Physics-II	PH201BS	CO-1	Realize the importance of behavior of a particle quantum mechanically.
					CO-2	Learn concentration estimation of charge carriers in semi conductors.
					CO-3	Learn various magnetic dielectric properties and apply them in engineering application.
					CO-4	Know the basic principles and applications of super conductors.
					CO-5	Understand the Laws of Electro magnetism and get an exposure on Magnetic and Dielectric materials.
10	I/II	R-16	Mathematics-II	MA202BS	CO-1	Use Laplace transform techniques for solving DE's
					CO-2	Evaluate integrals using Beta and Gamma functiona
					CO-3	Evaluate the multiple integrals and can apply these concepts to find areas, volumes, moment of inertia etc of regions on a plane or in space
					CO-4	The physical quantities involved in engineering field related to vector valued functions
					CO-5	Evaluate the line, surface and volume integrals and converting them from one to another
11	I/II	R-16	Mathematics-III	MA203BS	CO-1	Differentiate among random variables involved in the probability Models which are usefull for all branches of engineering
					CO-2	Calculate mean, proportions and variances of sampling distributions and to make important decisions s for few samples which are taken from a large data
					CO-3	Solve the tests of ANOVA for classified data
					CO-4	Find the root of a given equation and solution of a system of equations
					CO-5	Fit a curve for a given data .Find the numerical solutions for a given first order initial value problem
12	I/II	R-16	Computer Programming in C	CS204ES	CO-1	Demonstrate the basic knowledge of computer hardware and software.
					CO-2	Ability to write algorithms for solving problems.
					CO-3	Ability to draw flowcharts for solving problems.
					CO-4	Ability to code a given logic in C programming language.
					CO-5	Gain knowledge in using C language for solving problems.
					CO-1	Ability to prepare working drawings to communicate the ideas and information.
					CO-2	Ability to read, understand and interpret engineering drawings.

13	I/II	R-16	Engineering Graphics	ME205ES	CO-3	Make use of the knowledge of geometry and Engineering curves for constructions.
					CO-4	Construct various types of scales
					CO-5	Develop the lateral surface for sheet metal work. Convert isometric views to orthographic views and vice versa
14	I/II	R-16	Engineering Chemistry Lab	CH206BS	CO-1	Students are able to determination of parameters like hardness of water and rate of corrosion of mild steel in various conditions.
					CO-2	Students are analyzing the various water samples with different methods and various water treatment methods for industrial usages.
					CO-3	Students are able to able to perform methods such as conductometry, potentiometry and pH metry in order to find out the concentrations or equivalence points of acids and bases
					CO-4	Students are able to prepare polymers like Bakelite and nylon-6.
					CO-5	Students are able to estimations saponification value, surface tension and viscosity of lubricant oils
15	I/II	R-16	Engineering Physics Lab	PH207BS	CO-1	Understand the characteristics of Photo emitters and Photo detectors
					CO-2	Construct RC & LCR circuit in Series and parallel.
					CO-3	Study the magnetic field variation along the axis of the circular coil carrying current.
					CO-4	Understand the working of Optical fiber and find the values of Numerical Aperture and Bending Losses.
					CO-5	Find the value of Energy gap and Hall coefficient of a given semiconductor material
16	I/II	R-16	Computer Programming in C Lab	CS208ES	CO-1	Ability to design and test programs to solve mathematical and scientific problems.
					CO-2	Ability to write structured programs using control structures and functions.
					CO-3	Develop c programs using control structures
					CO-4	Develop c programs using functions , arrays and memory management
					CO-5	Develop c programs for processing strings .Develop c programs to organize and search for data
17	II/I	R-16	Mathematics – IV	MA301BS	CO-1	Analyze the complex functions with reference to their analyticity, integration using Cauchy's integral theorem
					CO-2	Calculate Taylor's and Laurent's series expansion of complex functions
					CO-3	Evaluate integrals and perform the bilinear transformation
					CO-4	Express any periodic function in term of sines and cosines and express a non-periodic function as integral representation
					CO-5	Analyze one dimensional wave and heat equation
18	II/I	R-16	Analog Electronics	EC302ES	CO-1	Acquire basic knowledge of physical and electrical conducting properties of semiconductors.
					CO-2	Develop the Ability to understand the design and working of BJT / FET amplifiers.
					CO-3	Design amplifier circuits using BJT s And FET's. and observe the amplitude and frequency responses of common amplifier circuits
					CO-4	Observe the effect of negative feedback on different parameters of an Amplifier and different types of negative feedback topologies.
					CO-5	Observe the effect of positive feedback and able to design and working of different Oscillators using BJTS.

19	II/I	R-16	Electrical Technology	EC303ES	CO-1	Analyze the performance of dc generators and motors.
					CO-2	Analyze the performance of transformers.
					CO-3	Understand the working principle three phase induction motors.
					CO-4	Analyze the performance of alternators
					CO-5	Known about the logic families and realization of logic gates.
20	II/I	R-16	Signals and Stochastic Process	EC304ES	CO-1	Formulate a given arbitrary signal in terms of complete set of orthogonal functions.
					CO-2	Understand the importance of sampling, sampling theorem and its effects.
					CO-3	Determine the conditions for distortion less transmission through a system.
					CO-4	Understand the concepts of Random Process and its Characteristics.
					CO-5	Understand the importance of Spectral Characteristics of System Response
21	II/I	R-16	Network Analysis	EC305ES	CO-1	Analyse of Electric Networks
					CO-2	Solve the given circuit with various theorems and methods.
					CO-3	Analyse the various three phase circuits star and delta connections.
					CO-4	Distinguish between tie set and cut set methods for solving various circuits.
					CO-5	Relate various two port parameters and transform them.
22	II/I	R-16	Electronic Devices and Circuits Lab	EC306ES	CO-1	Apply the concepts and analytical principles to analyze electronic (diodes, transistors, op-amps) circuits.
					CO-2	Understand the operation of op-amps, diodes and transistors in order to build circuits.
					CO-3	Conduct experiments involving electric and electronic components and to analyze and interpret the measurements results.
					CO-4	Design, construct and characterize electric and electronic circuits according to specification.
					CO-5	Quantify their ability to communicate effectively through weekly written reports and lab notebooks.
23	II/I	R-16	Basic Simulation Lab	EC307ES	CO-1	Understand the basic operation on Matrices.
					CO-2	Analyze the generation of various signals and sequences such as unit impulse, unit step, square, saw tooth, Triangular, sinusoidal, Ramp, Sinc.
					CO-3	Understand convolution between signals and sequences.
					CO-4	Calculate the Even and Odd parts of signal/sequences and Real and Imaginary parts of signal
					CO-5	Understand autocorrelation and cross correlation between signals and sequences .
24	II/I	R-16	Basic Electrical Engineering Lab	EC308ES	CO-1	Study different meters and instruments for measurement of electrical quantities
					CO-2	Study the linear and nonlinear characteristics of different types of loads experimentally
					CO-3	Design and experiment potential divider circuits
					CO-4	Experimentally verify the basic circuit theorems
					CO-5	Understand 3 phase balanced and unbalanced, star and delta connected supply and load and to measure power in 3 phase circuits
25	II/I	R-16	Environmental Science and Technology	*MC300ES	CO-1	Understand technologies on the basis of ecological principles and environmental regulations
					CO-2	Evaluate technologies on the basis of ecological principles and environmental regulations
					CO-3	Develop technologies on the basis of ecological principles and environmental regulations
					CO-4	Understand the impacts of developmental activities and mitigation measures
					CO-5	Understand the importance of ecological balance for sustainable development

26	II/II	R-16	Switching Theory and Logic Design	EC401ES	CO-1	Manipulate numeric information in different forms, example different bases signed integers
					CO-2	Understand varies codes such as ASCII, GRAY and BCD
					CO-3	Manipulate simple Boolean expressions using the theorems and postulates of Boolean algebra and to minimize combinational functions
					CO-4	Design and analysis small combinational circuits and to use standard combinational functions/building blocks to build larger more complex circuits
					CO-5	Design and analysis small sequential circuits and able to use standard sequential functions
27	II/II	R-16	Pulse and Digital Circuits	EC402ES	CO-1	Design integrator, differentiator, clippers, clamper using active and passive components
					CO-2	Classify various switching devices such as diode, transistor, SCR
					CO-3	Differentiate between logic gates and sampling gates
					CO-4	Design multivibrators using BJT for various applications
					CO-5	Construct logic gates using diodes and transistors, Understand synchronization techniques and sweep circuits
28	II/II	R-22	Control Systems	EE404ES	CO-1	Describe the feedback control
					CO-2	Describe basic components of control systems
					CO-3	Analyze various time domain methodologies for the design of linear control systems
					CO-4	Analyze frequency domain methodologies for the design of linear control systems
					CO-5	Analyze methods of stability analysis of systems from transfer function forms and able to develop the state space models for various systems
29	II/II	R-16	Analog Communications	EC405ES	CO-1	Describe the basics of Analog communications and various modulation and demodulation techniques in AM
					CO-2	Describe the basics of Analog communications and various modulation and demodulation techniques in FM
					CO-3	Distinguish between DSB-SC, SSB-SC, VSB techniques of AM
					CO-4	Respond upon different types of AM and FM transmitters and receivers
					CO-5	Demonstrate modulation and demodulation techniques in pulse communication techniques such as PAM, PWM and PPM.
30	II/II	R-16	Business Economics and Financial Analysis	SM405MS	CO-1	Understand, analyze and interpret the basics of economics
					CO-2	Understand, analyze and interpret the basics of accounting
					CO-3	Understand the frame work for both manual and computerized accounting process
					CO-4	Analyze how capital budgeting decisions are carried out.
					CO-5	Justify an insight into how production function is carried out to achieve least cost combination of inputs and cost analyses
31	II/II	R-16	Analog Communications Lab	EC406ES	CO-1	Demonstrate modulation and demodulation techniques.
					CO-2	Understand the operations of different types of detectors.
					CO-3	Analyze the signal transmission and receiving fundamental concepts.
					CO-4	Describe the operation of Multiplexing techniques.
					CO-5	Develop a knowledge pre-emphasis and de emphasis circuits used in the analog communication
					CO-1	Construct different linear networks like low pass circuits and high pass circuits and determine their response to different signals.
					CO-2	Determine how linear networks acts like integrator and differentiator and their voltage and band width formulae.

32	II/II	R-16	Pulse and Digital Circuits Lab	EC407ES	CO-3	Determine the voltage and transfer characteristics of clipper and clamper circuits and also learn about comparators.
					CO-4	Determine the switching characteristics of diode.
					CO-5	Understand the basic operating principles of sampling gates and their types and their applications.
33	II/II	R-16	Analog Electronics Lab	EC408ES	CO-1	Study different meters and instruments for measurement of electronic quantities
					CO-2	Study the characteristics of different semiconductor devices like diode, BJT, FET, UJT etc experimentally
					CO-3	Design and experiment with various application circuits using diodes
					CO-4	Design and experiment with various signal and power amplifier circuits using BJTs and FETs
					CO-5	Design and experiment with various voltage regulation circuits
34	II/II	R-16	GENDER SENSITIZATION LAB	*MC400HS	CO-1	To develop students' sensibility with regard to issues of gender in contemporary India and To expose the students to debates on the politics and economics of work
					CO-2	To provide a critical perspective on the socialization of men and women.
					CO-3	To introduce students to information about some key biological aspects of genders.
					CO-4	To help students reflect critically on gender violence.
					CO-5	To expose students to more egalitarian interactions between men and women.
35	III/I	R-16	Electromagnetic Theory and Transmission Lines	EC501PC	CO-1	Acquire knowledge in static electric and magnetic fields
					CO-2	Demonstrate an ability to apply Gauss' law, Ampere's Law, Biot- Savart law in the analysis of electromagnetic systems
					CO-3	Demonstrate an ability to apply Faraday's law and Maxwell's equations in the analysis of electromagnetic systems
					CO-4	Understand the concept of plane wave reflection and transmission at normal incidence.
					CO-5	Understand the voltage and current wave equations along a transmission line and able to understand incident and reflected waves, reflection coefficient, and Standing-Wave Ratio along a transmission line
36	III/I	R-16	Linear and Digital IC Applications	EC502PC	CO-1	Understand the working principle of operational amplifier.
					CO-2	Design multivibrators using 555 timer.
					CO-3	Construct Analog to Digital and Digital to Analog converters using operational amplifier.
					CO-4	Compare various logic families
					CO-5	Revise the basic concepts of 74xx and 40xx series ICs
37	III/I	R-18	Digital Communications	EC503PC	CO-1	Understand Digital modulation
					CO-2	Understand baseband modulation
					CO-3	Understand Spread spectrum modulation
					CO-4	Estimate the probability of error
					CO-5	Estimate bit rate using Channel coding

38	III/I	R-16	Fundamentals of Management	SM504MS	CO-1	Describe the fundamentals of management and the various theories of management
					CO-2	Apply the functions of management and practice in real world.
					CO-3	Understand the functional areas of management-Marketing, Finance, HRM and Operations Management.
					CO-4	Solve decision making problems and project management problems
					CO-5	Resolve the budget issues.
39	III/I	R-16	ELECTRONIC MEASUREMENTS AND INSTRUMENTATION	EC504PC	CO-1	provides an understanding of various measuring system functioning and metrics for performance analysis.
					CO-2	Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
					CO-3	Understanding the concepts of various measuring bridges and their balancing conditions.
					CO-4	Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.
					CO-5	Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers and bridges
40	III/I	R-18	Linear IC Applications Lab	EC505PC	CO-1	Demonstrate MASM assembler programming.
					CO-2	Develop an ALP in 8086 and its interfacing circuits.
					CO-3	Develop an ALP in 8051 for parallel ports and timers
					CO-4	Develop an ability in designing a microprocessor and microcontroller systems
					CO-5	Apply standard test and measurement equipment to evaluate digital interfaces.
41	III/I	R-16	Digital IC Applications Lab	EC506PC	CO-1	Demonstrate various combinational logic circuits and systems.
					CO-2	Demonstrate and test various sequential logic circuits and systems.
					CO-3	Extrapolate various counters and comparator circuits.
					CO-4	Design and test various shift register using digital ICs.
					CO-5	Investigate clock generation circuits using digital ICs.
42	III/I	R-16	Digital Communications Lab	EC507PC	CO-1	Develop any real application using digital modulation techniques.
					CO-2	Develop time division multiplexing concepts in real applications.
					CO-3	Measures the bandwidth of various modulation techniques and observes the output waveforms.
					CO-4	Estimate the probability of error
					CO-5	Design and illustrate electronic components & method to implement different communication circuits & systems
					CO-1	Inculcate moral values and become and socially responsible citizens of the society
					CO-2	Sense of right and wrong based on the moral philosophy and spirituality of our tradition

43	III/I	R-16	Professional Ethics	*MC500HS	CO-3	Aware of the problems of modern society and to make them understand the need for them as engineers and responsible citizens
					CO-4	Follow professional ethics and ethical practices in their profession
					CO-5	Sense of responsibility for the mankind and the need to practice harmonious and synergetic way of life respecting nature, environment and values
44	III/II	R-16	INTELLECTUAL PROPERTY RIGHTS	CE623OE	CO-1	Understand the parameter consideration viz antenna efficiency, beam efficiency etc.
					CO-2	Design antenna and field evaluation under various conditions
					CO-3	Understand the array system of the different antennas , will gain knowledge of about means of propagation of EM WAVES i.e., free space propagation
					CO-4	Understand the design issues, operations of fundamental antennas like yagi-uda, horn antenna etc..
					CO-5	Design a lens structure and also the bench setup for antenna parameter measurements
45	III/II	R-16	Computer Organization and Operating System	EC611PE	CO-1	Understand basic structure of a digital computer
					CO-2	Perform Arithmetic operations of binary number system
					CO-3	Understand the organization of the Control unit, Arithmetic and Logical unit, Memory unit and the I/O unit.
					CO-4	Demonstrate Operating system functions, types, system calls.
					CO-5	Define memory management techniques and dead lock avoidance
46	III/II	R-16	Antennas and Wave Propagation	EC601PC	CO-1	Understand the parameter consideration viz antenna efficiency, beam efficiency etc.
					CO-2	Design antenna and field evaluation under various conditions
					CO-3	Understand the array system of the different antennas , will gain knowledge of about means of propagation of EM WAVES i.e., free space propagation
					CO-4	Understand the design issues, operations of fundamental antennas like yagi-uda, horn antenna etc..
					CO-5	Design a lens structure and also the bench setup for antenna parameter measurements
47	III/II	R-16	Microprocessors and Microcontrollers	EC602PC	CO-1	Understand the principle of operation of Intel 8086 microprocessor
					CO-2	Execute assembly language programs on Intel 8086 including ascending order and descending order of data, string operations
					CO-3	Integrate Intel 8086 processor with 8255, DMA controller, Intel 8259, USART to develop the microprocessor based system
					CO-4	Develop and run program of Intel 8051 microcontroller
					CO-5	Analyze architecture and interrupt structure of RISC microcontrollers
48	III/II	R-16	Digital Signal Processing	EC603PC	CO-1	Describe periodic signals using Fourier series
					CO-2	Describe a periodic sequences using DTFT, Z-transform and DFT
					CO-3	Understand inter-relation between DFT and Various transforms



			Digital Signal Processing	EC6051C	CO-4	Calculate DFT using FFT algorithm and to understand importance of FFT algorithm
					CO-5	Design and represent IIR and FIR methods using different methods
49	III/II	R-16	Digital Signal Processing Lab	EC604PC	CO-1	Develop and Implement DSP algorithms in software using a computer language such as C with TMS320C6713 floating point Processor.
					CO-2	Develop various DSP Algorithms using MATLAB Software package.
					CO-3	Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.
					CO-4	Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques.
					CO-5	Design and Analyze Digital Filters using FDA Tool.
50	III/II	R-16	Microprocessors and Microcontrollers Lab	EC605PC	CO-1	Demonstrate MASM assembler programming.
					CO-2	Develop an ALP in 8086 and its interfacing circuits.
					CO-3	Develop an ALP in 8051 for parallel ports and timers
					CO-4	Develop an ability in designing a microprocessor and microcontroller systems
					CO-5	Apply standard test and measurement equipment to evaluate digital interfaces.
51	III/II	R-16	Advanced English Communication Skills Lab	EN606HS	CO-1	Develop their LSRW skills
					CO-2	Overcome their Mother tongue influence
					CO-3	Express/interpret their views without hesitation
					CO-4	Lose their stage fear and develop self-confidence
					CO-5	Be able to reach corporate expectations
52	IV/I	R-15	Microwave Engineering	EC701PC	CO-1	Calculate cut off frequency, identify possible modes and obtain mode characteristics
					CO-2	Understand the principle of operation of waveguides, tuning screws, attenuators etc;
					CO-3	Construct scattering matrix for various junctions, and will excel in measuring the microwave parameters.
					CO-4	Describe the basics of microwave solid state devices such as Gunn diode and Avalanche Devices
					CO-5	Categorize the IMPATT, TRAPATT diodes and efficiently use them in microwave engineering applications
53	IV/I	R-15	Computer Networks	EC721PE	CO-1	Design a protocol depending on various factors involved in communicating from one node to another node in a network
					CO-2	Employ network address and should be able to specify subnets and super nets by setting net mask
					CO-3	Explain what various types of wireless networks are and how these communicate using the given protocols.
					CO-4	Describe and analyze the hardware , software , components of a network and the inter relations

					CO-5	Establish effectively communicated technique information verbally, in writing, in presentation
54	IV/I	R-15	Embedded Sytem Design	EC734PE	CO-1	Identify the hardware and software components of an embedded system
					CO-2	Choose appropriate embedded system architecture for the given application
					CO-3	Modify programs for optimized performance of an embedded system and validate
					CO-4	Describe the basics of OS and RTOS
					CO-5	Understand embedded firmware design approach
55	IV/I	R-15	Object Oriented Programming	EC742PE	CO-1	Describe fundamental concepts of the object oriented paradigm
					CO-2	Define classes and interface class libraries such as java.lang, java.util, java.io
					CO-3	Develop GUI applications and give object oriented solutions for the complex problems.
					CO-4	Describe some important data structures such as one way , double linked list , binary trees with associated algorithms.
					CO-5	Perform graphical user interfaces with event programming
56	IV/I	R-15	VLSI Design	EC702PC	CO-1	Understand operation of a MOS transistor
					CO-2	Understand down to physical level and relate the knowledge to the development of its operational equations
					CO-3	Analyze and implement various logic gates and circuits, using MOS Transistors
					CO-4	Design circuit components and verify their performance using simulation tools
					CO-5	Design static CMOS Combinational circuits
57	IV/I	R-15	VLSI and E-CAD Lab	EC703PC	CO-1	Simulate various digital circuits.
					CO-2	Simulate and synthesize various CMOS circuits.
					CO-3	Understand the layout design rules for both static CMOS and dynamic clocked CMOS Circuits.
					CO-4	Develop an ability of designing of analog and digital CMOS circuits.
					CO-5	Develop a spice code for NMOS/ CMOS circuits and simulate
58	IV/I	R-15	Microwave Engineering Lab	EC704PC	CO-1	Gain knowledge and understanding of microwave analysis methods.
					CO-2	Apply analysis methods to determine circuit properties of passive/active microwave devices.
					CO-3	Determine the performance characteristics of microwave circuit or system using computer aided design methods.
					CO-4	Analyze various parameters of Waveguide Components.
					CO-5	Estimate the power measurements of RF Components such as directional Couplers.
					CO-1	Apply his/her knowledge to understand the industrial applications

59	IV/I	R-15	Industry Oriented Mini Project	EC705PC	CO-2	Observe the process of problem identification its formulation and solution.
					CO-3	Prepare a detailed report on the work carried
					CO-4	Present in front of the evaluation committee and other participants
60	IV/I	R-15	Seminar	EC706PC	CO-1	Conduct the literature survey in his / her chosen work of the specialized engineering domain
					CO-2	Have the recent developments in the chosen work
					CO-3	Prepare a detailed report on the work carried
					CO-4	Present in front of the evaluation committee and other participants
61	IV/II	R-15	SENSORS AND TRANSDUCERS	EC812PE	CO-1	To discuss need of transducers, their classification, advantages and disadvantages
					CO-2	To discuss working of different types of transducers and sensors..
					CO-3	To discuss basics of signal conditioning and signal conditioning equipment.
					CO-4	To discuss configuration of Data Acquisition System and data conversion.
					CO-5	To discuss the basics of Data transmission and telemetry. To explain measurement of various non-electrical quantities
62	IV/II	R-15	Optical Communications	EC853PE	CO-1	Understand and analyze the constructional parameters of optical fibers.
					CO-2	Analyse the signal distortion in optical fibers.
					CO-3	Estimate the losses due to attenuation, absorption, scattering and bending.
					CO-4	Compare various optical detectors and choose suitable one for different applications.
					CO-5	Design an optical system.
63	IV/II	R-15	Analog CMOS IC Design	EC862PE	CO-1	Design basic building blocks of CMOS analog ICs.
					CO-2	Determine the device dimensions of each MOSFETs involved.
					CO-3	Carry out the design of single and two stage operational amplifiers and voltage references.
					CO-4	Design differential and current.
					CO-5	Design CMOS operational amplifiers.
64	IV/II	R-15	Major Project	EC801PC	CO-1	Develop comprehensive solution of issues identified in project stage-1 and to meet the requirements as stated in project brief.
					CO-2	Synthesize the results of the detailed analytical studies conducted, lay down validity and design criteria, interpret the result for application to the problem, develop the concept and detailed design solution and to effectively communicate the thesis rationale.
					CO-3	Demonstrate the knowledge, skills and attitudes of a professional engineer.
					CO-4	Communicate with engineers and the community at large in written an oral forms.

					CO-5	Able to write effective technical report and demonstrate through presentation
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