



### COURSE OUTCOMES (R19 Regulation)

#### Course Name: Algebra & Calculus (19A54101)

19A54101	Algebra & Calculus
CO_1	Solve the system of linear equations, using technology to facilitate row reduction determine the rank, eigenvalues and eigenvectors. (BL-3)
CO_2	Translate the given function as series of Taylor's and Maclaurin's with remainders. (BL-3)
CO_3	Acquire the Knowledge maxima and minima of functions of several variable. (BL-1)
CO_4	Apply the techniques of Multiple integrals for the Area of the region bounded by curves and volume. (BL-3)
CO_5	Understand beta and gamma functions and its relations. (BL-2)

#### Course Name: Applied Physics (19A56101T)

19A56101T	Applied Physics
CO_1	<b>Identify</b> the importance of the optical phenomenon i.e. interference, diffraction and polarization related to its Engineering applications (BL2)
CO_2	Explain the significant concepts of dielectric and magnetic materials which lead to potential applications in the emerging micro devices (BL2)
CO_3	Understand the basic concepts of electromagnetic waves and its propagation in optical fibers along with its Engineering applications (BL2)
CO_4	Describe the importance of semiconductors in the functioning of electronic devices (BL2)
CO_5	Illustrate the basic properties of superconductors and nanomaterials (BL2)

**Course Name: Problem Solving & Programming (19A05101T)**

19A05101T	Problem Solving & Programming
CO_1	Understand the peripherals, ports and connecting cables and able to assemble the system. [BL- 2]
CO_2	Apply algorithmic approach to solve computational problems. [BL -3]
CO_3	Apply modular approach for solving the problems by using the control structures. [BL-3]
CO_4	Select the individual data elements to simplify solutions and provide efficient memory utilization. [BL-3]
CO_5	Develop sorting algorithms for heterogeneous data. [BL-3]

**Course Name: Communicative English 1 (19A52101T)**

19A52101T	Communicative English 1
CO_1	Describe the communication and writing skills in general communication. (BL-2)
CO_2	Develop the writing and life skills in structural manner of real time scenarios. (BL-3)
CO_3	Apply the knowledge of writing and speaking skills to enhance the career opportunities. (BL-3)
CO_4	Illustrate the concepts of writing and speaking skills to develop the skills in job opportunities.(BL - 2)
CO_5	Analyze the concepts of various real time scenarios to represent in an effective model. (BL - 4)

**Course Name: Electronics & Communication Engineering Workshop (19A04101)**

19A04101	Electronics & Communication Engineering Workshop
CO_1	Identify discrete components and Ics.
CO_2	Assemble simple electronic circuits over a PCB.
CO_3	Interpret specifications (ratings) of the component.
CO_4	<b>Demonstrate</b> disassembling and assembling a Personal Computer and make the computer ready to use.

**Course Name: Applied Physics Lab (19A56101P)**

19A56101P	Applied Physics Lab
CO_1	Understand the concepts of interference/diffraction and role of optical fiber parameters in communication (BL2)
CO_2	<b>Recognize</b> the importance of energy gap in the study of conductivity and hall effect in a semiconductor (BL2)
CO_3	Illustrate the magnetic and dielectric materials applications (BL2)
CO_4	Apply the principles of semiconductors in various electronic devices (BL3)

**Course Name: Problem Solving & Programming Lab (19A05101P)**

19A05101P	Problem Solving & Programming Lab
CO_1	Understand the peripherals, ports and connecting cables and able to assemble the system. [BL- 2]
CO_2	Apply algorithmic approach to solve computational problems. [BL -3]
CO_3	Apply modular approach for solving the problems by using the control structures. [BL-3]
CO_4	Select the individual data elements to simplify solutions and provide efficient memory utilization. [BL-3]
CO_5	Develop sorting algorithms for heterogeneous data. [BL-3]

**Course Name: Communicative English 1 Lab (19A52101P)**

19A52101P	Communicative English 1 Lab
CO_1	Understand the different aspects of the English language proficiency with emphasis on LSRW skills (BL -1)
CO_2	Apply communication skills through various language learning activities(BL -3)
CO_3	<b>Analyze</b> the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.(BL- 4)
CO_4	Analyze and exhibit acceptable etiquette essential in social and professional settings(BL -4)
CO_5	Understand awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English (BL -2)

**Course Name: Network Theory (19A04201T)**

19A04201T	Network Theory
CO_1	Apply Kirchoff's laws, network reduction techniques on simple electrical circuits with dependent & independent sources (BL-3)
CO_2	Understand significance of duality and dual networks and apply Select appropriate theorem for network simplification (BL-3)
CO_3	Analyze response of RL, RC & RLC circuits in time & frequency domains (BL-4)
CO_4	<b>Understand</b> magnetically coupled circuits performance, resonant frequency and bandwidth of a series or parallel RLC circuits (BL-2)
CO_5	Analyze network parameters for given two port network (BL-4)

**Course Name: Differential Equations and Vector Calculus (19A54201)**

19A54201	Differential Equations and Vector Calculus
CO_1	Solve the linear differential equations with constant coefficients by appropriate method (BL-3)
CO_2	Classify and interpret the solutions of linear differential equations (BL-2)
CO_3	Apply a range of techniques to find solutions of standard PDEs (BL-3)
CO_4	Illustrate the physical interpretation of Gradient, Divergence and Curl (BL-2)
CO_5	Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals (BL-3)

**Course Name: Chemistry (19A51102T)**

19A51102T	Chemistry
CO_1	Explain the molecular orbital energy level diagram of different molecular species.(BL-2)
CO_2	Acquire the knowledge of electrochemistry to improve the efficiency of batteries.(BL-3)
CO_3	<b>Demonstrate</b> the various preparation mechanisms of different polymers in engineering applications.(BL-2)
CO_4	Describe the various spectroscopic techniques used for the identification of functional groups and applications of chemical compounds. (BL-2)
CO_5	Apply Green's, Stokes and Divergence theorem in evaluation of double and triple integrals (BL-3)

**Course Name: Data Structures (19A05201T)**

19A05201T	Data Structures
CO_1	Understand the peripherals, ports and connecting cables and able to assemble the system. [BL- 2]
CO_2	Apply algorithmic approach to solve computational problems. [BL -3]
CO_3	Apply modular approach for solving the problems by using the control structures. [BL-3]
CO_4	<b>Select the</b> individual data elements to simplify solutions and provide efficient memory utilization. [BL-3]
CO_5	Develop sorting algorithms for heterogeneous data. [BL-3]

**Course Name: Engineering Workshop (19A03101)**

19A03101	Engineering Workshop
CO_1	Apply wood working skills in real world applications. [BL-3]
CO_2	Construct different parts with metal sheets in real world applications.[BL-3]
CO_3	Apply fitting operations in various applications.[BL-3]
CO_4	Apply different types of basic electric circuit connections.[BL-3]
CO_5	<b>Demonstrate</b> soldering and brazing.[BL-2]

**Course Name: Engineering Graphics Lab (19A03102)**

19A03102	Engineering Graphics Lab
CO_1	Show the various curves applied in engineering.[BL-2]
CO_2	Show the projections of straight lines, projections of planes graphically.[BL-2]
CO_3	Show the projections of solids and sections graphically.[BL-2]
CO_4	Show the development of surfaces of solids graphically.[BL-2]
CO_5	Make use of computers for drafting with Auto CAD software tool.[BL-3]

**Course Name: Network Theory Lab (19A04201P)**

<b>19A04201P</b>	<b>Network Theory Lab</b>
<b>CO_1</b>	Verify Kirchoff's laws and network theorems. [BL-1]
<b>CO_2</b>	Measure time constants of RL & RC circuits.[BL-4]
<b>CO_3</b>	Analyze behavior of RLC circuit for different cases.[BL-4]
<b>CO_4</b>	Design resonant circuit for given specifications.[BL-4]
<b>CO_5</b>	Characterize and model the network in terms of all network parameters..[BL-2]

**Course Name: Chemistry Lab (19A51102P)**

<b>19A51102P</b>	<b>Chemistry Lab</b>
<b>CO_1</b>	Determine the cell constant and conductance of solutions. (BL-3)
<b>CO_2</b>	Prepare advanced polymer materials. (BL-3)
<b>CO_3</b>	<b>Measure</b> the strength of an acid present in secondary batteries. (BL-3)
<b>CO_4</b>	Analyse the IR and NMR of some organic compounds.(BL-4)

**Course Name: Data Structures Lab (19A05201P)**

<b>19A05201P</b>	<b>Data Structures Lab</b>
<b>CO_1</b>	Select the data structure appropriate for solving the problem (BL-1)
<b>CO_2</b>	Develop searching and sorting algorithms (BL-3)
<b>CO_3</b>	<b>Illustrate</b> the working of stack and queue (BL-2)

**Course Name: Complex Variable and Transforms (19A54302)**

19A54302	Complex Variable and Transforms
CO_1	Explain the analyticity of complex functions and conformal mappings [BL:2].
CO_2	<b>Apply</b> Cauchy's integral formula and Cauchy's integral theorem to evaluate improper integrals along contours [BL:3].
CO_3	Explain the usage of Laplace Transforms and Fourier Transforms [BL:2].
CO_4	Evaluate the Fourier series expansion of periodic function [BL:5].
CO_5	Explain the usage of Z - Transforms [BL:2].

**Course Name: Signals and Systems (19A04301)**

19A04301	Signals and Systems
CO_1	Explain various types of Signals & Systems and Analyze the Periodic Signals by applying Fourier Series [BL:2].
CO_2	Analyze Spectral Characteristics of Continuous Time Signals using Fourier Transform [BL:3].
CO_3	Analyze Spectral Characteristics of Discrete Time Signals using Discrete Time Fourier Transform (DTFT) [BL:3].
CO_4	Analyze filter characteristics & Physical realization of LTI system and Explain about PSD & ESD [BL:3].
CO_5	Apply Laplace and Z transform to analyze Continuous & Discrete Time Signals & Systems [BL:3].

**Course Name: Electronic Devices and Circuits (19A04302T)**

19A04302T	Electronic Devices and Circuits
CO_1	Explain the characteristics & operation of P_N junction diode & effect of temperature on the characteristics of diode [BL:2].
CO_2	<b>Explain</b> V_I characteristics of all special diodes [BL:2]
CO_3	Analyze the performance of rectifies with & without filter, clipper, clamper & voltage regulator [BL:3]
CO_4	Explain the principle, operation & application of BJT & analyze the different configuration & biasing circuit [BL:2]

<b>CO_5</b>	Explain principal, operation and application of FET & MOSFET and analyze the different configurations and biasing circuits[BL:2]
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**Course Name: Probability Theory & Stochastic Process (19A04303)**

<b>19A04303</b>	<b>Probability Theory &amp; Stochastic Process</b>
<b>CO_1</b>	Explain the fundamental concepts of probability theory, random variables and conditional probability and evaluate the different probability distribute and density functions. [BL:2]
<b>CO_2</b>	Evaluate the single and multiple random variable concepts to expectation, variance and moments. [BL:5]
<b>CO_3</b>	Apply the different operations to multiple Random variables & understand the concept of linear Transfer Function of Gaussian random variable.
<b>CO_4</b>	Explain and analyze the random process with correlations and power spectral densities. [BL:2]
<b>CO_5</b>	Describe the response of linear system for random signals an inputs and explain low pass & band pass noise models of random process[BL:2]

**Course Name: Digital Electronics and Logic Design (19A04304)**

<b>19A04304</b>	<b>Digital Electronics and Logic Design</b>
<b>CO_1</b>	Explain different number systems & codes and apply basic laws, Demorgan theorems K-map &Q-M methods to simplify logic functions
<b>CO_2</b>	Analyze& design various combinational circuits [BL:3]
<b>CO_3</b>	Analyze & design various sequential circuits [BL:3]
<b>CO_4</b>	Describe functions of ROM, RAM, PLD, PLA and design simple digital systems using PLDs[BL:3]
<b>CO_5</b>	<b>Explain</b> characteristics & interfacing of logic families. [BL:2]

**Course Name: Electrical Technology (19A02304T)**

<b>19A02304T</b>	<b>Electrical Technology</b>
<b>CO_1</b>	Explain constructional features of various DC generators & their characteristics. [BL:2]
<b>CO_2</b>	Explain principle of operation of DC Machine working as motor and their characteristics. [BL:2]
<b>CO_3</b>	Analyze the performance of single phase transformer and three phase circuits. [BL:3]



<b>CO_4</b>	Analyze the torque production and performance of three phase induction motor. [BL:3]
<b>CO_5</b>	Explain the constructional features and operation of synchronous machines. [BL:3]

**Course Name: Electronic Devices & Circuits Lab (19A04302P)**

<b>19A04302P</b>	<b>Electronic Devices &amp; Circuits Lab</b>
<b>CO_1</b>	Explain the Characteristics of UJT, BJT, FET, and SCR. [BL-2]
<b>CO_2</b>	Design FET and BJT based amplifier circuits for the given specifications. [BL-4]
<b>CO_3</b>	Simulate Electronic Circuits by using Multisim/PSPICE. [BL-4]

**Course Name: Basic Simulation Lab(19A04305)**

<b>19A04305</b>	<b>Basic Simulation Lab</b>
<b>CO_1</b>	<b>Write</b> MATLAB program to generate signals and sequences. [BL-2]
<b>CO_2</b>	<b>Write</b> MATLAB program to perform arithmetic operations on signals and sequences. [BL-2]
<b>CO_3</b>	Compute Fourier transform of a given signal and plot its magnitude and phase spectrum. [BL-2]
<b>CO_4</b>	Determine Convolution and Correlation of signals and Sequences. [BL-2]

**Course Name: Electrical Technology lab (19A02304P)**

<b>19A02304P</b>	<b>Electrical Technology lab</b>
<b>CO_1</b>	Explain various characteristics of DC generators and DC motor [BL:2]
<b>CO_2</b>	Determine the efficiency & regulation of a Single Phase Transformer.
<b>CO_3</b>	Determine the power in 3- phase circuits [BL:2]
<b>CO_4</b>	Explain various characteristics of inductor motor & synchronous

**Course Name: Biology for engineers (19A99302)**

19A99302	Biology for engineers
CO_1	Explain basics of life, life processes, Animal and plant systems[BL:2]
CO_2	Explain about bimolecular & nucleic acid, their role in living cells, their structure, and function and how they are produced. And summaries the applications enzymes in industry & its conventions. [BL:2]
CO_3	Explain about the various sources & pollution and their preventive Measures. [BL:2]
CO_4	Explain hereditary units, i.e. DNA (gene) and RNA and their synthesis in living organism[BL:2]
CO_5	Explain about how biology Principles can be applied in our daily life using different technologies[BL:2]

**Course Name: Electromagnetic Waves & Transmission Lines(19A04401)**

19A04401	Electromagnetic Waves & Transmission Lines
CO_1	<b>Explain</b> basic laws of Static Electric field & Solve problems by applying laws of Electrostatics and Derive Maxwell's equation for Electrostatic Fields. [BL:2]
CO_2	Derive the Maxwell's Equations for both Magnetic fields & Electromagnetic fields and Apply the boundary conditions of Electromagnetic fields at the interface of different Media. [BL:2]
CO_3	Derive the Wave Equations for different Media & Explain the concept of Polarization of Electromagnetic Wave. [BL:2]
CO_4	Explain the principles of reflections &refraction's for different incidences and calculate Brewster angle, power flow & surface impedance's etc. [BL:2]
CO_5	Find the transmission line parameters and study the applications of different lengths of transmission lines. [BL:1]

**Course Name: Electronic Circuits - Analysis & Design (19A04402T)**

19A04402T	Electronic Circuits - Analysis & Design
CO_1	Analyze Low & High frequency models of BJT & FET and Design Amplifier Circuits. [BL:2]
CO_2	Design a Single Stage Amplifiers using BJT & FET with & without Coupling Capacitor and Explore the various effects of load & various capacitors on the performance of Amplifier Circuits[BL:4]
CO_3	Analyze & Design different multistage amplifier circuits[BL:4]
CO_4	<b>Analyze</b> characteristics of various types of feedback configurations and Analyze & Design different oscillators. [BL:3]

<b>CO_5</b>	Analyze the different Power & Tuned Amplifiers[BL:3]
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**Course Name: Control Systems(19A02404)**

<b>19A02404</b>	<b>Control Systems</b>
<b>CO_1</b>	Write the Differential Equation for Mechanical & Electrical System & Obtain the Transfer Function from Block Diagram and Signal Flow Graph[BL:1]
<b>CO_2</b>	Analyze the Time Domain Specifications and Calculate Steady State
<b>CO_3</b>	Analyze the Concept of stability in the Time Domain by Applying the concept of Routh Stability & Root Locus. [BL:3]
<b>CO_4</b>	Evaluate the Frequency Domain Specifications from Bode, Polar & Nyquist Plots and Design Compensator for various systems. [BL:5]
<b>CO_5</b>	<b>Explain</b> the concept of State Space, Controllability, Observability and Obtain the Transfer Function from State Space. [BL:2]

**Course Name: Analog Communications (19A04403T)**

<b>19A04403T</b>	<b>Analog Communications</b>
<b>CO_1</b>	Explain the Concepts of different Amplitude Modulation & Demodulation Techniques and Analyze in Time & Frequency domains. [BL:2]
<b>CO_2</b>	Explain the concepts of different Angle Modulation & Demodulation Techniques and Analyze in Time & Frequency domains. [BL:2]
<b>CO_3</b>	Analyze the Performance of Analog Communication System in the Presence of Noise[BL:3]
<b>CO_4</b>	<b>Explain</b> the concepts of different Analog Pulse Modulations & Demodulation Techniques & Analyze the performance of AM & FM receivers. [BL:2]
<b>CO_5</b>	Explain the concepts of Information theory & different Coding techniques and Apply the concepts to calculate the Channel Capacity. [BL:2]

**Course Name: Python Programming (19A05304T)**

<b>19A05304T</b>	<b>Python Programming</b>
<b>CO_1</b>	Apply the features of Python Language for basic computational problems[BL:3]
<b>CO_2</b>	Apply the features of Python language in various real applications[BL:3]
<b>CO_3</b>	Define and Demonstrate appropriate data structure of Python for solving a problem[BL:1]

<b>CO_4</b>	Design and implement Object Oriented Programs (OOPs) using Python for solving real-world problems. [BL:4]
<b>CO_5</b>	Apply modularity to Programs[BL:3]

**Course Name: Computer Architecture & Organization (19A04404)**

<b>19A04404</b>	<b>Computer Architecture &amp; Organization</b>
<b>CO_1</b>	Explain the various data representations & Develop composite Arithmetic Logic Shift Unit using Register Transfer & Micro operations. [BL:2]
<b>CO_2</b>	Describe organization & design of basic digital computer and illustrate techniques used in assembly language programming. [BL:2]
<b>CO_3</b>	Develop execution unit to show general register organization of typical CPU, illustrate instruction formats with addressing modes & discuss the characteristics of RISC. [BL:2]
<b>CO_4</b>	Discuss algorithms to specify the sequence of micro operations and Control Decisions required for implementation. [BL:2]
<b>CO_5</b>	Analyze the various issues related to input-output and memory organizations. [BL:3]

**Course Name: Universal Human Values (19A52301)**

<b>19A52301</b>	<b>Universal Human Values</b>
<b>CO_1</b>	Explain the significance of value inputs in a classroom and start applying them in their life and profession[BL:2]
<b>CO_2</b>	Distinguish between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual. [BL:2]
<b>CO_3</b>	Explain the role of a human being in ensuring harmony in society and
<b>CO_4</b>	Explain Existence as Co-existence of mutually interacting units in all-pervasive space[BL:2]
<b>CO_5</b>	Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work. [BL:2]

**Course Name: Electronic Circuits - Analysis & Design Lab (19A04402P)**

<b>19A04402P</b>	<b>Electronic Circuits - Analysis &amp; Design Lab</b>
<b>CO_1</b>	<b>Demonstrate</b> frequency response of Amplifiers using Multisim and Compare the performance with Hardware. .[BL-2]

<b>CO_2</b>	Analyze Negative Feedback amplifiers, multistage amplifiers for Low, Mid and high frequencies using Multisim and Compare the performance with Hardware. .[BL-3]
<b>CO_3</b>	Determine the efficiencies of Power Amplifiers using Multisim and Compare with Hardware. .[BL-2]
<b>CO_4</b>	Design RC and LC oscillators using multisim and compare with hardware. .[BL-4]
<b>CO_5</b>	<b>Demonstrate</b> Frequency response of tuned Amplifiers using Multisim and Compare the performance with Hardware. .[BL-2]

**Course Name: Analog Communications Lab (19A99301)**

<b>19A99301</b>	<b>Analog Communications Lab</b>
<b>CO_1</b>	Analyze different Analog Modulation & Demodulation Techniques. .[BL-3]
<b>CO_2</b>	Demonstrate the radio receiver Measurements & Characteristics. .[BL-2]
<b>CO_3</b>	Demonstrate the characteristics of mixer, Pre - emphasis & De - emphasis. .[BL-2]
<b>CO_4</b>	Simulate different Analog Modulation & Demodulation Techniques using MATLAB. .[BL-4]

**Course Name: Environmental Science(19A99301)**

<b>19A99301</b>	<b>Environmental Science</b>
<b>CO_1</b>	Explain The importance of Public Awareness & Various Resources[BL:2]
<b>CO_2</b>	<b>Explain</b> about various eco systems & their characteristics and biodiversity & its conventions. [BL:2]
<b>CO_3</b>	Explain about the various sources & pollution and their preventive Measures. [BL:2]
<b>CO_4</b>	Explain about the social issues related to environment & their preventive acts. [BL:2]
<b>CO_5</b>	Explain about the population explosion & family welfare programs and identify the natural assets & related case studies. [BL:2]

**Course Name: Integrated Circuits and Applications (19A04501T)**

<b>19A04501T</b>	<b>Integrated Circuits and Applications</b>
<b>CO_1</b>	Analyze BJT Differential Amplifier and the characteristics of operational amplifier. (BL-4).

CO_2	Design linear applications of an op-amp. (BL-4).
CO_3	Design non-linear applications of an op-amp (BL-4)
CO_4	Classify the working principle of data converters (BL-4).
CO_5	<b>Build</b> multi-vibrator circuits using special ICs. (BL-3).

**Course Name: Antennas and Wave Propagation (19A04502)**

19A04502	Antennas and Wave Propagation
CO_1	<b>Explain</b> the concepts of different antenna parameters to measure the performance of antennas. [BL:2]
CO_2	Derive various characteristics of antennas to design simple antennas.[BL:2]
CO_3	Design various VHF,UHF and microwave antennas for a given application. [BL:3]
CO_4	Describe microstrip antennas, its design and the procedures to measure the Gain, Radiation pattern and Directivity. [BL:2]
CO_5	Explain the concept of EM wave propagation through different layers of the atmosphere.[BL:2]

**Course Name: Digital Communications (19A04503T)**

19A04503T	Digital Communications
CO_1	Explain the sampling process and different types of digital modulation techniques for different sources. (BL-2)
CO_2	Analyze the error rate, error probability, Inter symbol Interference for base band pulse transmission system. (BL-3)
CO_3	Apply the knowledge of signals and system to know the performance of digital communication system in the presence of noise. (BL-3)
CO_4	Analyze the performances of different modulation schemes for pass-band data transmission. (BL-3)
CO_5	Analyze the different error control codes to detect and correct the error for digital transmission.(BL-3)

**Course Name: Data Communications and Networks (19A04504A )**

<b>19A04504A</b>	<b>Data Communications and Networks</b>
<b>CO_1</b>	Enumerate the layers of OSI and TCP/IP reference models to understand the role of protocols at different layers of a network
<b>CO_2</b>	Explain the various types of transmission media used in physical layer to understand the IEEE standards used in Ethernet and wireless LANs.[ BL: 2]
<b>CO_3</b>	Analyze a computer network under congestion to propose solutions for reliable data transfer using various error control and flow control methods in Datalink Layer. [BL:3]
<b>CO_4</b>	Understand the protocols in Network Layer and Transport Layer to build skills on subnetting and routing mechanisms and congestion control
<b>CO_5</b>	Familiarize with different Application Layer protocols to become conversant with primitives of network applications and working of

**Course Name: Electrical Engineering Materials (19A02506A )**

<b>19A02506A</b>	<b>Electrical Engineering Materials</b>
<b>CO_1</b>	Analyze the properties of different conducting materials [ BL: 4]
<b>CO_2</b>	Understand the classification of dielectric and high resistivity materials .[ BL: 2]
<b>CO_3</b>	Analyze the properties of solid insulating materials [BL:4]
<b>CO_4</b>	Understand the classification & properties of liquid and gaseous insulators. [BL:2]
<b>CO_5</b>	Design and develop Residential wiring [BL:6]

**Course Name: Integrated Circuits and Applications Lab (19A04501P )**

<b>19A04501P</b>	<b>Integrated Circuits and Applications Lab</b>
<b>CO_1</b>	Demonstrate the working of Op amp & Application specific analog ICs. [BL-2]
<b>CO_2</b>	Analyze operational amplifier based circuits for linear and non-linear applications. [BL-3]
<b>CO_3</b>	Design Multi vibrators using IC555 timer. [BL-4]
<b>CO_4</b>	Simulate all linear and nonlinear application based Op amp Circuits and compare with hardware.[BL-4]

**Course Name: Digital Communications Lab (19A04503P )**

19A04503P	Digital Communications Lab
CO_1	Demonstrate the behavior of Pulse code modulation and differential pulse code modulation techniques.[BL-2]
CO_2	<b>Demonstrate</b> the behavior of delta modulation and adaptive delta modulation techniques. .[BL-2]
CO_3	Analyze the behaviour of shift keying techniques.[BL-4]
CO_4	Compare the performance of channel coding techniques.[BL-2]
CO_5	Simulate all digital modulation and demodulation techniques using MATLAB. [BL-4]

**Course Name: Microprocessors and Microcontrollers (19A04601T )**

19A04601T	Microprocessors and Microcontrollers
CO_1	Interpret the architecture of 8085 & 8086 Microprocessor .(BL-2)
CO_2	Analyze <b>the</b> Instruction formats and addressing modes 8086 processor.(BL-4)
CO_3	Demonstrate the memory, I/O & peripheral Interfacing of 8086 processor(BL-2)
CO_4	Analyze the programming concepts to perform various operations using 8051 Microcontroller. (BL-4)
CO_5	Explain the architecture, addressing modes and assembly instruction set of ARM CotrexM0+ (BL-2)

**Course Name: Digital System Design through VHDL (19A04603)**

19A04603	Digital System Design through VHDL
CO_1	Outline the architectures of Field-programmable Gate Arrays and Hardware Description Language for VHDL design styles and digital
CO_2	Apply the different types of data types and operators for synthesizable systems based on industry-standard coding methods (BL-3)
CO_3	<b>Build</b> the various application based combinational circuits using VHDL in FPGA module (BL-3)
CO_4	Analyze the structure, operation and timing parameters of sequential circuits (BL-4)
CO_5	Design complex digital CPU modelling for advanced digital design applications such as vending machine and washing machines etc (BL-4)



**Course Name: Digital Signal Processing Lab (19A04602P )**

19A04602P	Digital Signal Processing Lab
CO_1	<b>Demonstrate</b> Fourier series and Fourier transform of discrete time signals.[BL-2]
CO_2	Design FIR and IIR digital filters and simulate using MATLAB.[BL-4]
CO_3	Determine the frequency response of various filters.[BL-2]
CO_4	Implement basic signal processing algorithms like FFT& DFT in MATLAB.[BL-2]
CO_5	Design DSP based real time processing systems.[BL-4]

**Course Name: Microprocessors and Microcontrollers Lab (19A04601P )**

19A04601P	Microprocessors and Microcontrollers Lab
CO_1	Execute 8086 programs using MASM Assembler.[BL-2]
CO_2	Execute 8051 programs using MASM Assembler.[BL-2]
CO_3	Experiment with ARM Cortex M0 – NXP LPC Xpress/1115.[BL-3]

**Course Name: Microwave Engineering and Optical Communications (19A04701T)**

19A04701T	Microwave Engineering and Optical Communications
CO_1	Explain the importance of waveguides and its parameters. [BL:2]
CO_2	Apply the Scattering matrix to analyze passive components. [BL:3]
CO_3	<b>Differentiate</b> Linear beam tubes and crossed field tubes in terms of operation and performance. [BL:4]
CO_4	Analyze the signal degradation in optical fibers. [BL:4]
CO_5	Compare the performance of various optical sources and detectors. [BL:4]

**Course Name: VLSI Design (19A04702T )**

19A04702T	VLSI Design
CO_1	Analyze the fabrication process and Basic electrical properties of MOS , CMOS and BICMOS Circuits.(BL-3).
CO_2	Describe the basic circuits concepts and different scaling methods for MOS Circuits.(BL-2).
CO_3	<b>Analyze</b> the different types of MOS amplifier for analog IC design. (BL-3).
CO_4	Design a MOSFET based combinational and sequential circuits using static and dynamic CMOS logic styles (BL-3).
CO_5	Demonstrate CAD tools for design testability of combinational and sequential (BL-2).

**Course Name: Image Processing (19A04703D)**

19A04703D	Image Processing
CO_1	Analyze various types of images mathematically.[BL2]
CO_2	Apply the image processing techniques for image enhancement. [BL3]
CO_3	Explain image segmentation techniques for given image.[BL 2]
CO_4	Justify DCT and wavelet transform techniques for image compression.[BL2]
CO_5	Describe various color models for color image processing.[BL2]

**Course Name: Renewable Energy Systems (19A02704A )**

19A02704A	Renewable Energy Systems
CO_1	<b>Explain</b> about solar thermal parameters.[BL-2]
CO_2	Explain the concept of PV effect in crystalline silicon and their characteristics.[BL-2]
CO_3	Explain the basics of wind energy conversion and system.[BL-2]
CO_4	Learn about disadvantages and advantages of Geo Thermal Energy Systems .[BL-1]
CO_5	Analyze the operation of tidal energy.[BL-3]

**Course Name: Microwave and Optical Communications Lab (19A04701P)**

<b>19A04701P</b>	<b>Microwave and Optical Communications Lab</b>
<b>CO_1</b>	<b>Explain</b> the mode characteristics of Reflex Klystron oscillator and negative resistance characteristics of Gunn Oscillator.[BL-2]
<b>CO_2</b>	Evaluate the Scattering matrix of given passive device experimentally and verify the same theoretically.[BL-4]
<b>CO_3</b>	Analyze the radiation characteristics of a given antenna.[BL-4]
<b>CO_4</b>	Establish optical link between transmitter and receiver experimentally to find attenuation and signal strength of the received signal.[BL-2]

**Course Name: VLSI Design Lab (19A04702P)**

<b>19A04702P</b>	<b>VLSI Design Lab</b>
<b>CO_1</b>	Simulate digital circuits using VHDL.[BL-4]
<b>CO_2</b>	Write VHDL code to synthesize digital circuits.[BL-2]
<b>CO_3</b>	Analyze the performance of digital circuits using FPGA.[BL-3]
<b>CO_4</b>	Analyze the performance of digital circuits using EDA tools for transistor design.[BL-3]