B.Tech (Electronics and Communication Engineering)

Program Outcomes (POs)

PO 1 Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems

PO 2 Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO 3 Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO 4 Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5 Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO 6 The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO 7 Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO 8 Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO 9 Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO 10 Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO 11 Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary

environments.

PO 12 Life-Long Learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO 01 Apply the fundamental concepts of electronics and communication engineering to design a variety of components and systems for applications including signal processing, networking, embedded systems, and VLSI.

PSO 02 Select and apply cutting-edge engineering hardware and software tools to solve complex problems in satellite navigation and remote sensing.

Course Outcomes (Cos)

2017-2021 Batch

SEMESTER	Subject Name	Subject Code	CO Code	CO Statements
III	APPLIED ENGINEERING MATHEMATICS III	17BS3MA01	17BS3MA01.1	Apply Fourier series, Fourier Transform to the functions and Z transform to find solution of difference equations.
			17BS3MA01.2	Analyze the data by fitting linear and non-linear equations using least square method.
			17BS3MA01.3	Apply numerical technique to solve algebraic, transcendental, integral problems and ordinary differential equations.
			17BS3MA01.4	Determine the solution of wave, heat equation and boundary value problems.
	ECONOMICS FOR ENGINEERS	17HSSC08	17HSSC08.1	Understand the core concepts and methods, theories on economics and their application to problem solving
			17HSSC08.2	Understand the causes of various economics problems and ways of addressing them, including interactions across local to global scales
			17HSSC08.3	Apply the concepts and methodologies to analyze and understand the relationship and interactions between social and Economic activities
			17HSSC08.4	Create awareness to use the economics theories and principle to make the sustainable solution at various levels
			17HSSC08.5	Analyse the basic theories of economics in critical thinking and problem solving
	ANALOG ELECTRONIC CIRCUIT DESIGN-I	17EC31	17EC31.1	Acquire knowledge of Working principles, characteristics and basic applications of BJT and FET. Power amplifier classifications such as Class A, Class B, etc.
			17EC31.2	Analyze the performance of FET amplifier in CS configuration, Power Amplifiers and Oscillator circuits.
			17EC31.3	Interpretation of performance characteristics of transistors amplifiers, frequency Response and Oscillators.

		17EC31.4	Apply the knowledge gained in the design of transistorized circuits, amplifiers and Oscillators.
		17EC31.5	Design various biasing circuits of BJT and FET circuits .
		17EC31.6	Estimate the feedback circuits using BJT
DIGITAL SYSTEM DESIGN	17EC32	17EC32.1	Distinguish between analog and digital systems
		17EC32.2	Understand and examine the structure of various number systems and its application in digital design.
		17EC32.3	Understand the various methods of simplification in solving digital circuit problems.
		17EC32.4	Analyze, develop the combinational and sequential logic circuits for required applications
		17EC32.5	Classify different configurations of integrated circuits, semiconductor memories and their importance in the applications of digital circuits
		17EC32.6	Design and implement digital systems both in hardware and using software simulation tool.
NETWORK ANALYSIS	17EC33	17EC33.1	Examine electrical network laws and transformations.
		17EC33.2	Discover mesh currents and nodal voltages using KVL and KCL.
		17EC33.3	Solve complex electrical networks using appropriate theorems.
		17EC33.4	Solve a given network function using Laplace / Inverse Laplace Transforms.
		17EC33.5	Design AC resonance and Filter circuits.
		17EC33.6	Construct the voltage and current characteristcs of complex Electrical Networks.
ANALOG ELECTRONIC CIRCUIT DESIGN-I LAB	17EC31L	17EC31L.1	Demonstrate different applications of diode- clipper, clamper, full wave rectifier.
		17EC31L.2	Demonstrate voltage regulation by Zener diode.
		17EC31L.3	Design linear voltage regulator using regulator IC chip.
		17EC31L.4	Design two stage RC coupled amplifier.
		17EC31L.5	Validate network theorems for DC circuits.
		17EC31L.6	Analyze practical behavior of BJT characteristics.
DIGITAL SYSTEM DESIGN LAB	17EC32L	17EC32L.1	Identify the various digital ICs and understand their operation
		17EC32L.2	Analyze digital logic at gate and switch level for combinational logic circuits.
		17EC32L.3	Analyze digital logic at gate and switch level for sequential logic circuits.
		17EC32L.4	Design digital circuitry using logic gates, analyze and demonstrate timing diagrams.
		17EC32L.5	Students should be able to use a complex sequential logic circuit as part of a solution to an open ended design problems.
		17EC32L.6	Develop skill to build, and troubleshoot digital circuits
ENERGY STUDIES	17MCC03	17MCC03.1	Understand the energy scenario and its importance of the society
		17MCC03.2	Understand and suggest few energy management and energy conservation techniques in daily life.
		17MCC03.	Aware of energy policies.

			3	
			17MCC03.4	Enrage the technologies importance in today's energy scenario.
IV	INFORMATION THEORY AND CODING	17EC41	17EC41.1	To define probabilities measure of information of source and mathematical model of channels
			17EC41.2	To apply and analyze source and channel coding techniques.
			17EC41.3	To design and construct source channel for a source
			17EC41.4	Inspect error detection and correction inlinear block codes
			17EC41.5	Develop encoding circuits for cyclic codes
			17EC41.6	To simulate source and channel coding technique using Matlab
	ELECTROMAGNETIC FIELD THEORY	17EC42	17EC42.1	Understand the principles behind static and dynamic Electric Fields
			17EC42.2	Understand the principles behind static and dynamic Magnetic Fields
			17EC42.3	Analyze the principles and concepts of Electromagnetic static and dynamic Fields
			17EC42.4	Analyze the concepts of Maxwell's equations and its application
			17EC42.5	Analyze the concepts of Electromagnetic Wave behavior in various medium.
			17EC42.6	Determine the solutions for the problems related to Electromagnetic fields & waves both manually as well as using Electromagnetic tool
	SIGNALS AND SYSTEMS	17EC43	17EC43.1	Classify signals and systems based on their properties.
			17EC43.2	Determine time domain response of a system using convolution operation.
			17EC43.3	Analyze frequency content of signals and frequency response of systems using Fourier techniques.
			17EC43.4	Demonstrate the use of inverse Fourier techniques.
			17EC43.5	Analyze discrete time signals and systems using Z-transform.
			17EC43.6	Demonstrate applications of transform domain analysis.
	ANALOG ELECTRONIC CIRCUIT DESIGN –II	17EC44	17EC44.1	Understand basic op-amp configurations and application of negative feedback in op-amp circuits.
			17EC44.2	Explain linear, frequency independent circuits with resistive feedback using op-amps.
			17EC44.3	Analyze various circuits using opamp like Inverting, Non Inverting, Peak Detectors, Log and Antilog, Log multipliers, Oscillators Comparator, Schmitt trigger, waveform generators like Astable, Monostable, triangular waveform etc., using Op-Amp.
			17EC44.4	Apply the concepts in designing of various circuits using opamp like Inverting, Non Inverting, Peak Detectors, Log and Antilog, Log multipliers, Oscillators Comparator, Schmitt trigger, waveform generators like Astable, Monostable, triangular waveform etc., using Op-Amp.
			17EC44.5	Classify and design various active filter circuits.
			17EC44.6	Illustrate the design of various OpAmp regulators.

	ANALOG COMMUNICATION	17EC45	17EC45.1	To understand the fundamentals of Communication systems and concepts of modulation.
			17EC45.2	To analyze modulation techniques with respect to generation and detection
			17EC45.3	To apply the concepts in designing and implementing communication circuits.
			17EC45.4	To compare the merits of various modulation techniques
			17EC45.5	To analyse the noise peformance of analog communication system
			17EC45.6	To configure the parameters of a communication receiver model
	ANALOG ELECTRONICS CIRCUITS DESIGN –II LAB	17EC44L	17EC44L.1	Verify the operation of different op-amp circuits (e.g. inverting, non-inverting, differentiator, integrator, Schmitt trigger, etc.)
			17EC44L.2	Design and test the performance of Symmetrical and Asymmetrical AstableMultivibrator.
			17EC44L.3	Construct the MonostableMultivibrator using op-amp
			17EC44L.4	Build the Astable and MonstableMultivibrator using IC 55 timer.
			17EC44L.5	Analyze the circuit and operation of Series Regulator and Precision Rectifier.
			17EC44L.6	Design the D/A converter using op-amp
	ANALOG COMMUNICATION LAB	17EC45L	17EC45L.1	To Design, test and analyse of Modulation and demodulation circuits
			17EC45L.2	To design, test, and analyse of communication circuits using tools such as TINA/P-SPICE
			17EC45L.3	To analyse PLL characteristics
			17EC45L.4	To design and analyze power amplifiers
			17EC45L.5	To design and analyse the characteristics of filters
			17EC45L.6	To design, test, and analyse of amplitude nad frequency modulation using MATLAB simulation tool
V	DISCRETE MATHEMATICS	17EC51	17EC51.1	To learn the geometric and algebraic methods of representing objects, To understand map coloring problems.
			17EC51.2	To analyzing about the Graph Theory
			17EC51.3	To understand and applying the fundamental principles of counting, Probability and mathematical logic.
			17EC51.4	To Evaluating relation and principle of inclusion and exclusion and Generating functions and recurrence relation.
	NANO ELECTRONICS	17EC52	17EC52.1	Outline the fundamentals of Nanoelectronics.
			17EC52.2	Demonstrate the use of tunneling junctions, graphene and carbon nanotubes.
			17EC52.3	Illustrate the concepts of semiconductor physics.
			17EC52.4	Compare and contrast the process flow required to fabricate the state of the art transistor technology.
			17EC52.5	Illustrate the use of semiconductor nanostructures.
	DIGITAL SIGNAL PROCESSING	17EC53	17EC53.1	Explain the conversion between time and frequency domain representations of signals and understand the importance of DFT.
			17EC53.2	Demonstrate the application of DFT using linear filtering approach and mapping of transfer functions.

		17EC53.3	Analyze the use of DFT using DIT-FFT algorithm.
		17EC53.4	Analyze the use of DFT using DIF-FFT algorithm.
		17EC53.5	Design and realize an IIR digital filter for the given specifications.
		17EC53.6	Design and realize a FIR digital filter for the given specifications.
ARM CONTROLLER	17EC54	17EC54.1	Explain various parameters used in processor design..
		17EC54.2	Construct assembly language code for a given problem statement.
		17EC54.3	Illustrate the CPU cores in embedded ARM application.
		17EC54.4	Explain the significances of system resource
		17EC54.5	Develop efficient C-Language code.
		17EC54.6	Interface peripheral devices to LPC1768 ARM cortex M3 based microcontroller.
RF ENGINEERING - I	17EC55	17EC55.1	Able to understand basics of microwave system and analyze high power microwave amplifiers.
		17EC55.2	Able to analyze high power microwave oscillators.
		17EC55.3	Able to analyze microwave network theory and scattering parameters
		17EC55.4	Able to comprehend and analyze parameters of microwave Passive devices and characterization of microwave passive devices.
		17EC55.5	Able to understand the operating principles of low power solid state devices.
		17EC55.6	Able to comprehend measuring instruments and analyze a microwave system.
CONTROL SYSTEM	17EC56	17EC56.1	Compare open and closed systems..
		17EC56.2	Solve a given model and obtain a transfer function.
		17EC56.3	Examine the stability of LTI system in time and/or frequency domain.
		17EC56.4	Construct the state space representation of analog and digital systems.
		17EC56.5	Determine controllability and observability of a given system.
		17EC56.6	Illustrate industry based applications of control system.
ARM LAB	17EC54L	17EC54L.1	Develop ARM Programmers Model algorithms and/or flowchart for a given problem definition.
		17EC54L.2	Build project workspace using Keilmicrovision 4 in assembly and/or ARM C programming for a given task.
		17EC54L.3	Interpret data stored in processors registers and memory during the program execution.
		17EC54L.4	Design hardware interface with LPC1768 microcontroller.
		17EC54L.5	Comprehend and write effective reports and design documentation.
		17EC54L.6	Develop the schematic for simpler applications related societal problems using ARM cortex M3 based microcintrollers.
RF AND DSP LAB	17EC55L	17EC55L.1	Understand operation of Microwave active components
		17EC55L.2	Apply transmission line theory to determine line/load impedance.

			17EC55L.3	Analyze performance of microwave passive devices through determining their S-parameters
			17EC55L.4	Understanding of frequency domain analysis of discrete time signals.
			17EC55L.5	Design &analyze DSP systems like IIR Filter etc.
			17EC55L.6	Design &analyze DSP systems like FIR Filter etc.
VI	R F ENGINEERING - II	17EC61	17EC61.1	Distinguish between various Antenna Parameters and their significance in choosing an antenna for the given application
			17EC61.2	Analyze the performance of antenna arrays using point source concept
			17EC61.3	Deduce expressions for fields and radiation resistance for basic antenna types.
			17EC61.4	Design an antenna using simulation suite for the given specifications
			17EC61.5	Compare the performance of different antenna types for the required application
			17EC61.6	Apply knowledge of radio wave propagation through various layers of atmosphere in various communication scenarios.
	DIGITAL COMMUNICATION	17EC62	17EC62.1	Understand concept of sampling and reconstruction of baseband signals in digital Communication systems
			17EC62.2	Explain pulse code modulation and line coding methods
			17EC62.3	Analyse delta modulation techniques and baseband data transmission
			17EC62.4	Analyse the generation and detection of digital modulation techniques
			17EC62.5	Illustrate the optimal reception of digital signals.
			17EC62.6	Compare various multiple access techniques in Digital Communication system
	SYSTEM VERILOG	17EC63	17EC63.1	Explain the fundamental concepts of digital verilog and design fabrication process
			17EC63.2	Outline the features of hardware design and coding guidelines of advanced Verilog programming
			17EC63.3	Make use of advanced functions and keywords of System Verilog for design process
			17EC63.4	Model the design with advanced data and structural primitives of System Verilog
			17EC63.5	Compare the sequential and parallel programming model of System Verilog
			17EC63.6	Develop the test bench to verify the design module with advanced simulating environment
	VLSI DESIGN	17EC64	17EC64.1	Demonstrate a clear understanding of basic working of MOS transistor with their second order effects and analyze DC characteristics of CMOS inverter for different b ratio.
			17EC64.2	Impart knowledge of general steps required for fabrication process of IC's related to l based design rules and stick diagrams.
			17EC64.3	Analyze the delay and power, also with proper sizing and scaling in CMOS logic circuits.
			17EC64.4	Examine MOS circuits by selecting suitable CMOS logic families for high speed applications.

		17EC64.5	Design various arithmetic building blocks.
		17EC64.6	Analyze the functionality of DRAM and SRAM cell.
DIGITAL COMMUNICATION LAB	17EC62L	17EC62L.1	Design and Implement the digital modulation circuits
		17EC62L.2	Design and implement various components of a PCM system
		17EC62L.3	Analyze Performance of optical communication system and TDM system
		17EC62L.4	Analyze Performance of optical Time Division Multiplexing and Demultiplexing system
		17EC62L.5	Design various types of antennas and analyze their performance
		17EC62L.6	Simulate & Measure the Different parameters of digital modulation techniques
VLSI LAB	17EC64L	17EC64L.1	Design Analog CMOS Logic circuit and verify the functionality using cadence.
		17EC64L.2	Design Digital CMOS Logic circuit and verify the functionality using cadence.
		17EC64L.3	Estimate the various design performance parameter of CMOS Circuit.
		17EC64L.4	Demonstrate ability to provide efficient solutions for complex engineering problems in the area of microelectronics (VLSI) individually.
		17EC64L.5	Compare the performance of various memory circuits using cadence.
		17EC64L.6	To develop team work, communication and relate to lifelong learning.
OPTICAL FIBER COMMUNICATION	17EC651	17EC651.1	Analyze the capabilities, advantages and disadvantages of optical fiber mode of information transmission.
		17EC651.2	Understand the characteristics of different types of optical fibers, signal degradation in them and methods of control.
		17EC651.3	Acquire the skill of the working of modern semiconductor based optical sources, detectors and other components which were crucial to OFC practical applications.
		17EC651.4	Analyze various types of optical links and their functioning.
		17EC651.5	Describe OFC functions of componets
		17EC651.6	Explain WDM concepts and optical networks
IMAGE PROCESSING	17EC652	17EC652.1	Understand the fundamentals of digital image and image processing application areas
		17EC652.2	Analyze image enhancement techniques in spatial domain
		17EC652.3	Analyze image enhancement techniques in frequency domain
		17EC652.4	Explain various image restoration techniques.
		17EC652.5	Analyze image restoration techniques and color image processing
		17EC652.6	Understand and analyze image compression techniques
PROGRAMMING IN JAVA	17EC653	17EC653.1	Define and understand Object Oriented programming concepts using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
		17EC653.2	Identify classes, objects, members of a class and the relationships among them needed for finding the solution to specific problem.

		17EC653.3	Apply the concepts to achieve re usability using inheritance.
		17EC653.4	Implement interfaces and to create packages and describe how faster application development can be achieved.
		17EC653.5	Demonstrate exception handling mechanisms with real world examples.
		17EC653.6	Design and Develop applications using JDBC connectivity.
VLSI DESIGN VERIFICATION	17EC654	17EC654.1	Introduce the concepts and techniques of design verification.
		17EC654.2	Understand the technology challenges and verification technology options.
		17EC654.3	Study different approaches for verification methodologies.
		17EC654.4	Understand the concept of manufacturing tests of digital circuits.
		17EC654.5	Understand fault modeling, simulation, Automatic Test Pattern Generation, BIST etc
		17EC654.6	Explain test generation and DFT.
INTERNET OF THINGS	17EC655	17EC655.1	Interpret the impact and challenges posed by IoT networks leading to new architectural models.
		17EC655.2	Compare and contrast the deployment of smart objects and the technologies to connect them to network.
		17EC655.3	Appraise the role of IoT protocols for efficient network communication.
		17EC655.4	Illustrate different sensor technologies for sensing real world entities the applications of IoT in Industry
		17EC655.5	Elaborate the need for Data Analytics and Security in IoT.
		17EC655.6	Interpret the security challenges of IoT enabled devices.
COMPUTER COMMUNICATION NETWORK	17EC661	17EC661.1	Compare various computer communication networks and network reference model..
		17EC661.2	Illustrate the types of transmission media used in real time applications.
		17EC661.3	Explain the various protocols used in data link layer.
		17EC661.4	Analyze various routing protocols and IP addressing mechanism.
		17EC661.5	Discuss the session layer design issues and Transport layer services
		17EC661.6	Describe various paradigms and protocols in presentation and Application Layer.
DSP ARCHITECTURE	17EC662	17EC662.1	Comprehend the knowledge and concepts of digital signal processing techniques.
		17EC662.2	Apply the knowledge of DSP computational building blocks to achieve speed in DSP architecture or processor.
		17EC662.3	Apply knowledge of various types of addressing modes, interrupts, peripherals and pipelining structure of TMS320C54xx processor.
		17EC662.4	Develop basic DSP algorithms using DSP processors.
		17EC662.5	Explain Interfacing Memory and Parallel I/O Peripherals to Programmable DSP Devices
		17EC662.6	Perform Interfacing for Applications of DSP Processors
FUNDAMENTALS OF	17EC663	17EC663.1	Outline the fundamentals of python.
		17EC663.2	Illustrate the usage of different data types such as numeric,

	PYTHON PROGRAMMING			strings, lists, tuples and dictionaries.
			17EC663.3	Apply the knowledge of basics of python to operate on Files.
			17EC663.4	Develop basic applications utilizing the features of graphics and multimedia in python.
			17EC663.5	Create simple GUI applications using python.
			17EC663.6	Describe the process involved Networking in python and interfacing with hardware.
	ASIC DESIGN	17EC664	17EC664.1	Describe the concepts of ASIC design methodology, data path elements, operators, I/O cells.
			17EC664.2	Apply logical effort technique for predicting delay, delay minimization and FPGA architectures.
			17EC664.3	Analyze the design of FPGAs and ASICs suitable for specific tasks, perform design entry and explain the physical design flow.
			17EC664.4	Explain algorithms for floorplanning and placement of cells for optimized area and speed.
			17EC664.5	Explain and apply routing algorithms for optimization of length and speed.
			17EC664.6	Develop Applications using new designs.
	SENSORS AND ACTUATORS	17EC665	17EC665.1	Classify sensors/transducers based on different criteria.
			17EC665.2	Interpret the principle of operation of various sensor types.
			17EC665.3	Examine the values of characteristic parameters for different sensors
			17EC665.4	Analyze the performance of sensors through various characteristic parameters.
			17EC665.5	Compare different types of sensors based on the physical parameters such as strain, motion, position and light etc.
			17EC665.6	Choose a particular sensor based on specifications for the given application in real life scenario.
VII	PROJECT WORK - I	17ECPW01	17ECPW01.1	Formulate the problem statement that addresses issues related to but not restricted to society, environment, industry and research..
			17ECPW01.2	Select and apply appropriate hardware and/or software tools to accomplish the problem definition.
			17ECPW01.3	Demonstrate knowledge and understanding of the engineering principles.
			17ECPW01.4	Develop the confident persona.
			17ECPW01.5	Adapt the art of technical writing.
			17ECPW01.6	Publish or patent the findings of the work accomplished in the project.
	SATELLITE COMMUNICATION	17EC711	17EC711.1	Understand the fundamentals of satellites and frequency allocation
			17EC711.2	Illustrate the Earth and the space segment of satellite and the working principle of robot sensors
			17EC711.3	Analyse the orbital mechanics and propagation impairments
			17EC711.4	Apply space link power budget and design satellite up downlinks
			17EC711.5	Illustrate various satellite multiple access techniques
			17EC711.6	Understand various satellite services and applications

STATISTICAL SIGNAL PROCESSING	17EC712	17EC712.1	Summarize the fundamental concept of Statistical Decision Theory
		17EC712.2	Analyze the various signal estimation techniques with additive noise
		17EC712.3	Design and development of optimum filters using classical and adaptive algorithms.
		17EC712.4	Extrapolate the importance of least squares techniques and decomposition methods in analyzing the signal estimations.
		17EC712.5	Develop LMS based algorithms
		17EC712.6	Implement various adaptive filters
CLOUD COMPUTING	17EC713	17EC713.1	Explain the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS etc.
		17EC713.2	Analyze the trade-offs between deploying applications in the cloud and over the local infrastructure.
		17EC713.3	Analyze various cloud programming models and apply them to solve problems on the cloud.
		17EC713.4	Deploy applications over commercial cloud computing infrastructures such as Amazon Web Services, Windows Azure, and Google AppEngine.
		17EC713.5	Program data intensive parallel applications in the cloud.
		17EC713.6	Solve a real-world problem using cloud computing through group collaboration.
MIXED SIGNAL DESIGN	17EC714	17EC714.1	Develop the art of analog and mixed signal integrated design.
		17EC714.2	Make students well versed with the fundamental building blocks of analog IC.
		17EC714.3	Students can analyze and design Analog circuits such as differential Amplifier, OPAMP, Current mirrors, Biasing circuits, OTAs using MOSFETs.
		17EC714.4	.Design switched capacitor circuits
		17EC714.5	Have sound knowledge on Data Converter Fundamentals
		17EC714.6	Students can also analyze and design mixed mode circuits such as ADCs, DACs using MOSFETs
ARDUINO AND RASPBERRY PI	17EC715	17EC715.1	Analyze the features and principles of Arduino
		17EC715.2	Apply the C programming for Arduino
		17EC715.3	Analyze the serial data communication using Arduino and features of different types of sensors.
		17EC715.4	Analyze the functionalities of Raspberry Pi.
		17EC715.5	Apply Python programming language for communication on Raspberry Pi.
		17EC715.6	Create a small electronics device using Arduino and Raspberry Pi.
WIRELESS SENSOR NETWORKS	17EC721	17EC721.1	Recognize the basics and applications of wireless sensor networks
		17EC721.2	Describe various concepts of MAC layer and routing protocols that exist for sensor networks
		17EC721.3	Demonstrate the Transport layer protocols and Middleware architecture
		17EC721.4	Analyze the operating systems and its design issues
		17EC721.5	Select the network management system and the

			infrastructure
		17EC721.6	Build the sensor networks with network simulators
SPEECH AND AUDIO PROCESSING	17EC722	17EC722.1	Understand basic concepts of speech production, speech analysis and synthesis.
		17EC722.2	Analyse Speech coding techniques.
		17EC722.3	Understand speech and speaker recognition systems.
		17EC722.4	Develop systems for various applications of speech processing.
		17EC722.5	Identify suitable audio processing techniques for various applications
		17EC722.6	Explain harmonic speech processing techniques.
LINUX SHELL SCRIPT AND PERL	17EC723	17EC723.1	Explain various Linux command syntax and semantics.
		17EC723.2	Understand writing shell scripts to perform repetitive tasks using conditional statements.
		17EC723.3	Identify to process command-line arguments for access of various files and directories.
		17EC723.4	Develop individual capability in problem solving using the tools presented in interprocess communication.
		17EC723.5	Demonstrate effective use of shell scripts and programs of structured programming.
		17EC723.6	Design and implement perl scripting and programs.
CAD FOR VLSI	17EC724	17EC724.1	Understand of VLSI Design Automation and acquire knowledge about CAD tools used for VLSI design.
		17EC724.2	Develop algorithms to solve the complex design problems in ICs using Graph theory.
		17EC724.3	Analyze physical design problems and employ appropriate automation algorithms for partitioning and floorplanning
		17EC724.4	Analyze physical design problems and employ appropriate automation algorithms for placement and routing
		17EC724.5	Analyze the performance issues in circuit and physical layout of a IC.
		17EC724.6	Establish comprehensive understanding of the various phases of logical synthesis and simulation
MSP430 MICROCONTROLLERS	17EC725	17EC725.1	Understand the architectural features and instruction set of 16 bit microcontroller MSP430
		17EC725.2	Develop programs using the various instructions of MSP430 for different applications
		17EC725.3	Understand the functions of the various peripherals which are interfaced with MSP430 microcontroller.
		17EC725.4	Analyze instruction set of MSP430 and develop programs for control applications using assembly language and embedded C
		17EC725.5	Describe the power saving modes in MSP430.
		17EC725.6	Recognize the low power applications using MSP430 microcontroller
CRYPTOGRAPHY AND NETWORK SECURITY	17EC731	17EC731.1	Perform encryption and decryption using classical encryption techniques
		17EC731.2	Establish strong understanding on various block cipher principles
		17EC731.3	Use public key and private key algorithms for securing communications

		17EC731.4	Demonstrate sound knowledge in different message authentication mechanims
		17EC731.5	Analyze security issues in web
		17EC731.6	Provide solutions to various kinds of internet security threats
NAVIGATION AND REMOTE SENSING	17EC732	17EC732.1	understand the basics of navigation and remotes sensing
		17EC732.2	gain insight to various positioning systems and remote sensing missions
		17EC732.3	analyse various optical and microwave remote sensing sensors
		17EC732.4	understand Geographical Information Systems
		17EC732.5	Describe the use of optical sensors in navigation system
		17EC732.6	Explain the principles of Space borne Remote Sensing and Missions and GIS
AN INTRODUCTION TO ARTIFICIAL INTELLIGENCE	17EC733	17EC733.1	Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
		17EC733.2	Develop awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems, image processing and other machine learning models.
		17EC733.3	Apply and solve problems with uncertain information using Bayesian approaches.
		17EC733.4	Analyze the capability to represent various real life problem domains using logic based techniques and use this to perform inference or planning.
		17EC733.5	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
		17EC733.6	Summarize concept of Natural Language processing to problems leading to understanding of cognitive computing.
LOW POWER VLSI DESIGN	17EC734	17EC734.1	understand dynamic and static power dissipation and factors affecting them.
		17EC734.2	Apply Power reduction techniques possible at circuit ,logic level
		17EC734.3	explain the equations, approximations and techniques available for deriving a device model with specified properties.
		17EC734.4	explore and improvise on the latest techniques used for designing power-efficient logic gates, latches, and flip-flops
		17EC734.5	Perform energy computation for transistor channels.
		17EC734.6	Carry out software design for low power devices.
ROBOTICS AND AUTOMATION	17EC735	17EC735.1	Understand the history and configurations and future aspects of robotics
		17EC735.2	Analyze the robot motions and the working principle of robot sensors
		17EC735.3	Illustrate the and image processing techniques in the machine vision system of robot
		17EC735.4	Understand the history and configurations of automation.
		17EC735.5	Analyze the overview and classification of different manufacturing systems
		17EC735.6	Analyze the control system for automation.

SYNTHETIC APERTURE RADAR	17EC741	17EC741.1	Understand fundamental principles of Synthetic Aperture Radar
		17EC741.2	Interpret Pulse compression of linear FM signals
		17EC741.3	Perform Range Fourier Transform, Azimuth Fourier Transform, Range Inverse Fourier Transform
		17EC741.4	Analyze Azimuth Aliasing and the Doppler Centroid
		17EC741.5	Comprehend signal properties of SAR
		17EC741.6	Analyze SAR processing algorithms like low squint case and high squint case
MULTIRATE SIGNAL PROCESSING	17EC742	17EC742.1	Analyze IIR and FIR filter specifications
		17EC742.2	Design structures for upsampling and downsampling of signals using polyphase decomposition
		17EC742.3	Design digital filter banks based on various techniques
		17EC742.4	Design Paraunitary perfect reconstruction (PR) filter
		17EC742.5	Design Linear phase perfect reconstruction QMF banks
		17EC742.6	Use MATLAB tool to undertake the design and simulation
INTRODUCTION TO MACHINE LEARNING	17EC743	17EC743.1	Understand the basic concepts of Machine Learning and Characterize machine learning algorithms as supervised, semi-supervised, and unsupervised.
		17EC743.2	Utilize effectively the linear regression algorithm and understand the concept of Decision trees.
		17EC743.3	Develop algorithms to solve the challenging problems of Machine Learning associated with the complex networks.
		17EC743.4	Analyze the various approaches available in Machine Learning which can be used for classification and regression of data sets.
		17EC743.5	Examine the use of neural network and computational learning theory in Machine Learning.
		17EC743.6	Develop algorithm to solve complex problems of Clustering of Data Set in Machine Learning using numerous types of clustering algorithms.
SYSTEM ON CHIP	17EC744	17EC744.1	Exhibit sound knowledge on system architecture.
		17EC744.2	Identify processors for various applications
		17EC744.3	Demonstrate knowledge in advanced processors and memory systems
		17EC744.4	Analyze bus models and configuration devices
		17EC744.5	Select the appropriate system resources CPU, I/O, Memory, Cache and ECC Memory to improve the system performance
		17EC744.6	Select the appropriate system resources Microcontroller/FPGA/ASIC to improve the system performance
REAL TIME OPERATING SYSTEMS	17EC745	17EC745.1	Develop programs for real time services, firmware and RTOS, using the fundamentals of Real Time Embedded System, real time service utilities, debugging methodologies and optimization techniques.
		17EC745.2	Select the appropriate system resources (CPU, I/O, Memory, Cache, ECC Memory, and Microcontroller/FPGA/ASIC to improve the system performance.

			17EC745.3	Apply priority based static and dynamic real time scheduling techniques for the given specifications.
			17EC745.4	Analyze deadlock conditions, shared memory problem, critical section problem, missed deadlines, availability, reliability and QoS.
			17EC745.5	Develop programs for multithreaded applications using suitable techniques and data structure.
			17EC745.6	Demonstrate sound knowledge on High availability and Reliability Design
			17XX751.1	Understand the history and configurations and future aspects of robotics
			17XX751.2	Analyze the robot motions and the working principle of robot sensors
			17XX751.3	Illustrate the and image processing techniques in the machine vision system of robot
			17XX751.4	Understand the history and configurations of automation.
			17XX751.5	Analyze the overview and classification of different manufacturing systems
			17XX751.6	Analyze the control system for automation.
			17XX752.1	Understand the history and configurations and future aspects of robotics
			17XX752.2	Appreciate the use of Display Devices in Engineering.
			17XX752.3	Understand the Complexity of Design of Display Devices.
			17XX752.4	Understand High Definition Displays
			17XX752.5	Explain the working principle of Paper-like Displays
			17XX752.6	Explain the working principle of Low Power
			17XX761.1	Learn about soft computing techniques and their applications
			17XX761.2	Analyze various neural network architectures
			17XX761.3	.Understand perceptrons and counter propagation networks and define he fuzzy systems
			17XX761.4	Analyze the genetic algorithms and their applications.
			17XX761.5	Explain the concepts and techniques for designing intelligent systems
			17XX761.6	understand the basic areas of Soft Computing including Artificial Neural Networks, Fuzzy Logic and Genetic Algorithms
			17XX762.1	Implement interactive web page(s) using HTML, CSS and JavaScript..
			17XX762.2	Build Dynamic web site using JAVA/ J2EE Programming and Database connectivity
			17XX762.3	Describe and differentiate different Web Extensions
			17XX762.4	Demonstrate Rich Internet Application.
			17XX762.5	Able to use JSP for web design
			17XX762.6	Discuss concepts related to web services
VIII				
	RADAR SIGNAL PROCESSIN	17XX811	17XX811.1	Explain the principles of elements and functions involved in radar signal processing.
			17XX811.2	Explain the sampling process in radar signal processing

	G		17XX811.3	Understand the quantization process in radar signal processing
			17XX811.4	Understand different Radar signal models.
			17XX811.5	Describe different types of radar waveforms.
			17XX811.6	Discuss on Doppler processing and its issues.
	IMAGE PROCESSING	17XX812	17XX812.1	Understand the fundamentals of digital image and image processing application areas
			17XX812.2	Analyze image enhancement techniques in spatial domain
			17XX812.3	Analyze image enhancement techniques in frequency domain
			17XX812.4	Explain various image restoration techniques.
			17XX812.5	Analyze image restoration techniques and color image processing
			17XX812.6	Understand and analyze image compression techniques
	REMOTE SENSING APPLICATIONS	17XX821	17XX821.1	Explain physical principles and sensing process in remote sensing.
			17XX821.2	Explain different type of sensors (optical, microwave, thermal and LIDAR) and their characteristics.
			17XX821.3	Describe preprocessing requirements and discuss various Digital Image Processing techniques.
			17XX821.4	Rationalise statistical outlook of satellite images and different classification approaches with respect to diverse applications.
			17XX821.5	Apply the knowledge of remote sensing in various thematic studies
			17XX821.6	Describe various GIS and Navigation tools and techniques within spatial analytical framework and handle spatial and non-spatial database.
	NAVIGATION SYSTEM	17XX822	17XX822.1	understand the navigation principles and equations
			17XX822.2	analyse multi sensor navigation systems
			17XX822.3	analyse satellite based navigation systems
			17XX822.4	understand the navigation principles and equations
			17XX822.5	understand Geographical Information Systems
			17XX822.6	Describe the use of optical sensors in navigation system