



## Koneru Lakshmaiah Education Foundation

(Category -1, Deemed to be University estd. u/s. 3 of the UGC Act, 1956)

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Campus: Green Fields, Vaddeswaram - 522 302, Guntur District, Andhra Pradesh, INDIA.

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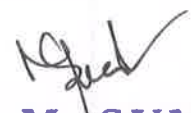
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Department of Electronics and Communication Engineering

Program: B.Tech -ECE

Academic Year : 2022-23

Course Code	Course Name	CO NO	CO Description
<b>HUMANITIES SCIENCE COURSES</b>			
22UC1101	Integrated Professional English	1	Understand the concepts of grammar to improve communication, reading, and writing skills
		2	Demonstrate required knowledge over Dos and Don'ts of speaking in the corporate context . Demonstrate ability to face formal situations / interactions.
		3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices
		4	Apply the concepts of writing to draft corporate letters, emails and memos
22UC1202	English Proficiency	1	Demonstrating different interpersonal skills for employability
		2	Distinguishing Business essential skills
		3	Classifying social media and corporate communication skills.
		4	Applying analytical thinking skills

  
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22UC2103	Professional Communication Skills	1	Able to spot the common grammatical errors related to sentence structure, preposition, concord, relative and conditional clauses and parallel structures. The learner should be efficient to construct a context-determined text in addition to learning Technical Writing Skills.
		2	Able to read, understand, and interpret a text intrinsically as well as extrinsically. The learner can browse a text quickly to come-up with a gist and personal interpretation. Able to create a healthy work-environment and prove to be an asset or one of the most reliable resources to the organization.
		3	Apply the concepts of time and work; men-time-work problems based on wages, pipes and cisterns. Apply the concepts of time and distance and solve the problems related to average speed, relative speed.
		4	Apply Venn diagrams to find out appropriate conclusions from the given statements. Apply the logical implications and also the negations of various connectives to find the solutions. Analyze the data and represent in the form of Venn diagrams to find relations between any given set of elements.
22UC2304	Corporate readiness Skills	1	Extend word power for developing effective speaking and writing skills
		2	Interpret Interpersonal Skills
		3	Differentiate critical and general reading skills
		4	Demonstrate necessary skills to be employable

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22UC0007	Indian Heritage and Culture	1	To familiarize with various aspects of the culture and heritage of India through ages.
		2	To acquaint with the contributions of Indians in the areas of languages and literature, religion and philosophy
		3	To understand the Social structure and the spread of Indian culture abroad
		4	To know the development of Science and Technology in India through ages and to appreciate the contributions of some of the great Indian scientists
22UC0008	Indian Constitution	1	To understand Constitutional development after Independence
		2	To learn the fundamental features of the Indian Constitution
		3	To get a brief idea of the powers and functions of Union and State Governments
		4	To understand the basics of working of Indian Judiciary and the Election Commission
22UC0009	Ecology & Environment	1	Understand the importance of Environmental education and conservation of natural resources.
		2	Understand the importance of ecosystems and biodiversity.
		3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.
		4	Understand and identify the basic aspiration of human beings
22UC0010	Universal Human Values & Professional Ethics	1	Envisage the roadmap to fulfill the basic aspiration of human beings.
		2	Analyze the profession and his role in this existence.
		3	Learn critical elements of entrepreneurship and its development from institution's perspective

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22UC0011	Entrepreneurship	1	Understand the process of entrepreneurship and its eco system in an educational institute to fit in entrepreneurship zone
		2	Understand & Learn Design Thinking skills towards product innovation & prototype design
		3	Learn the essential component of planning a new startup, including a. Recognizing viable market opportunities & Market assessment via secondary market research and customer discovery via primary market research b. Creating a profitable business model and an executable business plan c. Protecting the intellectual property at the heart of their technology company d.
		4	Developing financial projections that are aligned with the proposed business plan
		5	Study the practices of working with Co-students in other discipline, integrating creative business strategies with solid engineering and effectively working in multi disciplinary teams
		6	Recognize the methods of making decisions in highly uncertain and unstructured environments to take feedback from a large variety of sources that use it to improve their business plans, or help them to 'pivot' and find alternative ideas or approaches

**BASIC SCIENCE COURSES**

20MT1101	Mathematics for Computing	1	Apply matrix algebra to the real-world applications in engineering, physical and biological sciences, computer science, finance, economics and solving the system of equations.
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		2	Apply basic and computational techniques on discrete structures like relations, orders, functions & FSM, Lattices, and propositional & predicate logic
		3	Apply graph theory to solving real world structures and their related applications.
		4	Apply Statistical methods to solving the real-world applications in Engineering science, Economics and Management.
		5	Apply basic concepts of Aptitude and Reasoning to solve engineering and real world problems (Tests in skilling hours)
19MT2102	Mathematics for Engineers	1	Apply differential and integral calculus to find maxima and minimum of a function.
		2	Demonstrate the Fourier series and Laplace transforms.
		3	Describe the probability, random variables and Distributions
		4	Explain the complex variables, analytic functions, stochastic process and algebraic structures
19BT1001	Biology for Engineers	1	Acquire the Knowledge of basic biology
		2	Acquire the Knowledge of Human Biological Systems
		3	Acquire Knowledge on Microorganisms and Biosensors
22UC1102	Design Thinking and Innovation	1	Understand the basics of design thinking and its implications in product or service development
		2	Understand and Analyse the requirements of a typical problem
		3	Plan the necessary activities towards solving the problem through ideation and prototyping
		4	evaluate the solution and refine them based on the customer feedback
<b>SCIENCE ELECTIVE-1</b>			

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22PH1008	Physics for Electronic Engineers	1	Ability to understand classification of solids based on their Energy Bands.
		2	Ability to understand the conducting and semiconducting properties of solids at the microscopic level.
		3	Ability to understand the dielectric properties of materials at the microscopic level and their applications.
		4	Ability to understand the magnetic interactions in materials and the applications.
		5	Apply the knowledge on structure and properties of materials while executing related experiments and develop some inter disciplinary projects
22PH1004	Solid State Physics	1	Understands spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.
		2	Understands role of molecular level vibrations in determining thermal properties of materials, heat treatment methods for changing the microstructure of materials and micro and macro level responses of materials subjected to load, for identification of materials having specific engineering applications.
		3	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.

  
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		4	Understands the role of electronic energy band structures of solids using various models, classification of materials based on their band structures and their properties
		5	Apply the knowledge on structure and properties of materials while executing related experiments and develop some inter disciplinary projects.
<b>SCIENCE ELECTIVE-2</b>			
22CY1101	Engineering Chemistry	1	Demonstrate different types of semiconducting materials
		2	Illustrate photo-physical basis of light absorption and emission by materials
		3	Sketch the underlying principles of organic light emitting diodes
		4	Explain the concepts of solar cells modules and memory devices
		5	An ability to apply and generate experimental skills
22CY1004	Organic Electronics	1	Develop knowledge of materials for application in different types of semiconducting devices
		2	Utilize the concepts of light absorption and emission processes of in materials
		3	Identify the underlying principles of organic light emitting diodes
		4	Develop the concepts of materials in solar cells modules and memory devices
		5	An ability to apply and generate experimental skills used for industry
<b>ENGINEERING SCIENCE COURSES</b>			
20SC1101	Computational Thinking for Design	1	Design basic and complex building blocks for real world problems using structured programming paradigm
		2	Apply computaional thinking into logic design for solving real world problems

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		3	Apply CRUD operations on basic data structures
		4	Apply CRUD operations on linear data structures
		5	Apply the structured programming paradigm with logic building skills on basic and linear data structures for solving real world problems
20SC1202	Data Structures	1	Apply measures of efficiency on algorithms and Analyse different Sorting Algorithms.
		2	Analyse and compare stack ADT and queue ADT implementations using linked list and applications.
		3	Analyse the linked implementation of Binary, Balanced Trees and different Hashing techniques.
		4	Analyse different representations, traversals, applications of Graphs and Heap organization.
		5	Develop and Evaluate common practical applications for linear and non-linear data structures.
20ME1103	Design Tools Workshop - I	1	Design a product using 3D modeling in Auto Desk Fusion 360 through the concept of Engineering Design Process.
		2	Design of static webpages using HTML5 and CSS.
		3	Apply the concepts of Latex in writing the reports.
		4	Apply visualization techniques in creating data visualization dashboards with tools like Power BI.
19SC1209	Design Tools Workshop - II	1	Demonstrate the design ideology by 3D printing, 3D scanning techniques
		2	Illustrate the design ideology by incorporating VR technique and VR technology, Visualize and present his design idea by applying AR technique and Hologram

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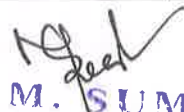


		3	Summarizing PCB technology and their applications
		4	Demonstrate Arduino based skill with different interfaces
20SC1203	Object Oriented Programming	1	Understand basic Concepts of OOP, fundamentals of java and apply the concepts of classes and objects through Java Language. Apply constructors, Overloading, parameter passing.
		2	Apply access control, Inheritance, Packages.
		3	Apply Interfaces, Exception Handling, multi- threading, I/o
		4	Apply collection framework and event driven programming.
		5	Apply object-oriented programming concepts to write programs and Analyses requirements and design to implement lab-based project with SDLC in a group of students.
22EC1101	Digital Logic & Processors	1	Understand the structure of a digital computer and design combinational circuits for processor using the principles of Boolean Algebra and gates
		2	Analyze the operation of latch/flip-flop and design timing and sequence control circuits using flip-flop
		3	Apply the programmable logic and design digital circuits using Programmable logic devices
		4	Apply the minimization techniques and Construct optimized combinational and sequential logic circuits
		5	Design of combinational and sequential circuits with logic gates and flip-flops with a verification using Logisim and Verilog HDL tool

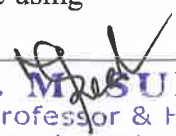
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22EC1202	Computer Organization & Architecture	1	Able to understand the computer organization and architecture through Arithmetic and logic unit, system bus, addressing modes and instruction set
		2	Apply the concept of arithmetic and logical unit in CPU design and memory mapping techniques like direct mapping, Associate, and block set associate mapping in Cache memory
		3	Apply the concepts of the DMA controller and I/O transfer techniques in data transfer between peripherals and processor
		4	Analyze pipelining operation in instruction execution and parallel computing architectures to speed up program execution
22EC1213	Design of Basic Electronics and Circuits	1	Analyze the V-I relations of different passive circuit elements
		2	Apply different circuit analysis techniques on practical circuits.
		3	Analyze the V-I relations of different active circuit elements.
		4	Identify the practical circuits comprising semi conductor devices.
22EC2111	Electronic System Design Workshop	1	Analyse the Analog and Digital electronic systems and their impacts on the performance
		2	Design PCB art -work by following PCB design rules using the Software and learning about fabrications, packaging and EMI/EMC issues
		3	Apply the Raspberry Pi microcontroller to design an embedded system for modern electronic system design

  
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		4	Analyse the Electronic Circuits for the noise reduction designs in components and circuits, high frequency designs and CAD packages
		5	Design the different Electronic Circuits and Develop with PCB FABRICATION techniques and also design an embedded system using raspberry Pi to demonstrate for social problems.
22EC2214	IoT Workshop	1	Demonstration of various Sensors both Analog & Digital for IoT Applications
		2	Applying & Interfacing various micro controllers with IoT: Micro controllers boards, ESP8266, Peripherals (Motors, Camera, Speaker, Displays), Controlling through Mobile & Web
		3	Analyze different protocols with IoT Data Communication: Wi-Fi Protocols, Bluetooth, BLE, WSN, Zigbee, RFID, NFC, Client Server, Cloud.
		4	Examine the various Protocols & Case Studies : Issues & Challenges : Security, Privacy, Scalability, Store and Analytics Case Studies: Health, Smart cities, Village/ Agriculture
		5	Design and develop various mini projects using Node MCU, ESP 32 and Raspberry Pi for various applications.
<b>PROFESSIONAL CORE COURSES</b>			
22EC2103	Analog Electronic Circuit Design	1	Analyze the operation of electronic devices like transistors and illustrate their electronic behaviour using Multisim.
		2	Distinguish linear and nonlinear circuits using lumped elements and analyze their response using Multisim

  
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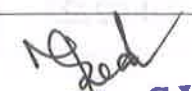
		3	Interpret feedback in amplifiers and realize them through lumped element circuits and linear ICs
		4	Design various electronic circuits using linear ICs and demonstrate their applications using Multisim
		5	Design Analog circuits for realistic applications and demonstrate it through a mini-project
22EC2104	Communication Signals & System Design	1	To Interpret and analyse different types of signals and perform various operations on them.
		2	To make use of transforms in the analysis of signals and systems.
		3	To utilize properties and operations of signals for analysing the effects in the various communication systems.
		4	To develop the foundation of signal processing for communication and analyse with system design.
22EC2105	Analog and Digital Communication	1	Apply time and frequency analysis techniques to Analog modulation systems.
		2	Analyze different digital modulation techniques.
		3	Analyze digital carrier ,signaling techniques with baud rate considerations.
		4	Analyze different switching techniques and real time signalling systems.
		5	Design and analyze analog and digital communication circuits through project based learning using modern tools.
22EC2106	Embedded Controllers & Embedded Systems Design	1	Apply knowledge and demonstrate programming proficiency using the various addressing modes and data transfer instructions of 8086 microprocessor & 8051 Microcontroller.

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		2	Analyze the Interfacing of Peripherals to the 8051 Microcontroller through programming & Apply the basic architectures of PIC and ATMEGA 32 Microcontrollers.
		3	Apply the concepts of ARM - CORTEX STM-32 Microcontroller and RTOS
		4	Apply the concepts of SoC and Modern Microcontroller Boards key Features, Specifications & Applications.
		5	Analyze the applications of programming with 8051, 8086 and Arduino on hardware / software.
22EC2207	Electromagnetic Fields & Applications	1	Apply the principles of vector calculus and static fields to estimate the static electric fields and magnetic field due to different sources
		2	Develop the boundary conditions on E, H Fields and extend the concepts to obtain the governing laws of electromagnetic field that helps to perceive the wave propagation
		3	Analysis of different electromagnetic field applications
		4	Analyse different advanced electromagnetic field applications
22EC2208	Digital Signal Processing	1	Develop DFT and apply that to analyze signals in the frequency domain
		2	Construct IIR filters for filtering operation
		3	Construct FIR filters and find solutions for filtering problems
		4	Analyse the multi-rate signal processing concepts

  
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		5	Develop signal processing algorithms in software and apply them to finding solutions to real time problems
22EC2210	Network Protocols & Security	1	Interpret the basic network structure, software and models, device and applications
		2	Analyse the error detection and correction techniques in link layer protocols with cisco packet tracer
		3	Design and analyse different routing algorithms and network layer protocols
		4	Design and analyse transport and application layer protocols
		5	Design of different networking protocols using simulation

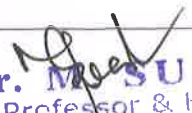
#### FLEXI CORE COURSES

22EC2221	Embedded System Design	1	Able to apply the principle concept of embedded systems and the architecture of embedded system design.
		2	Able to apply the role of controller, timer and interfaces for embedded system design
		3	Able to design and analyze the various communication interface and protocols for efficient embedded systems.
		4	Able to analyse an embedded system considering the trade-off between designing functionality in hardware versus software.
		5	Able to apply and analyse the Embedded system design knowledge using the architecture and programming and Performance analysis for modular implementation for a complete system.
22EC2222	Digital VLSI Design	1	Realize Digital CMOS device with different methodologies

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		2	Understand the various CAD Tool design synthesis and functional simulation processes
		3	Design various combinational and sequential digital circuits using Verilog HDL.
		4	Design and modeling of various CMOS digital circuits.
		5	Design and implement the combinational and sequential circuits using Xilinx Vivado Full Suite
22EC2223	Introduction to Robotics	1	Apply the functional elements to build simple robot
		2	Apply Denavit -Hattenberg parameters to position the manipulators
		3	Apply the differential motion through Jacobian to control the manipulator
		4	Analyze the force control techniques using Lagrange dynamic model
		5	Apply CNN and asses various metrics for realistic applications
22EC2224	Deep Network Arcitectures	1	Apply various deep learning techniques for training and testing of data sets
		2	Apply various network architectures for the analysis of data
		3	Apply deep and recurrent neural networks with various case studies.
		4	Apply the concept of radiation mechanism of EM waves and interpret the relationships between antenna parameters.
		5	Apply the theoretical principles of a small current element and illustrate the power radiated by different antennas and their radiation characteristics.

  
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22EC2225	Radiating Systems & Wave Propagation	1	Analyze different types of antennas arrays and discuss the antenna in real time applications.
		2	Analyze the atmospheric and terrestrial effects on radio wave propagation at different frequencies.
		3	Design the basic radiating systems and analyze the different parameters by using EM tools.
		4	Understand working of cellular mobile communication and methods to improve channel capacity and reduce interference.
		5	Explore and study different fading mechanisms in mobile communication.
22EC2226	Wireless Communication	1	Apply the concepts of equalization and diversity techniques to mitigate fading in wireless channels.
		2	Interpret the concepts of Wireless Architecture and Standards.
		3	Analyze Spectrum bands of wireless technologies, verification of different types of fading and study various communication protocols.
		4	Understand the 2basic communication principles on computer networks to analyse the performance of computer networks
		5	Understand the knowledge of design issue, analyse and configure different Data Link layer protocols
22EC2227	Communication Networks	1	Apply the knowledge of IP addressing to analyse and configure different routing and network layer protocols
		2	Apply the knowledge of transport layer protocols and analyse congestion control algorithms with application layer protocols

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		3	Apply the knowledge of different protocols in the different layers and execute in simulation tool.
		4	Construct the Bio-signal recording system and interpret the outcome
		5	Apply the Knowledge of Medical Instruments in clinical and ambulance to assist the patient.
22EC2228	Biomedical Electronics and IoT for Health Care	1	Identify the various Biosensors for healthcare and monitor health using Nextgen Internet of Things Technology.
		2	Analyse the various IoMT sensor and develop the applications for medical field.
		3	Analyze the IoT based Health monitoring and Elderly Assist modules.
		4	Construct the Bio-signal recording system and interpret the outcome
		5	Apply the Knowledge of Medical Instruments in clinical and ambulance to assist the patient.
22EC2229	Wireless sensor Networks	1	Identify the various Biosensors for healthcare and monitor health using Nextgen Internet of Things Technology.
		2	Analyse the various IoMT sensor and develop the applications for medical field.
		3	Analyze the IoT based Health monitoring and Elderly Assist modules.
		4	Realize MOS device with transient and DC characteristics
		5	Understand the characteristics of CMOS inverter
22EC2230	Low-Power VLSI Circuits	1	Analyze the static and dynamic characteristics of CMOS circuits
		2	Evaluate the performance of CMOS circuits

  
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		3	Design and implement the combinational and sequential circuits using Cadence VLSI Design Full Suite
		4	Realize MOS device with transient and DC characteristics
		5	Understand the characteristics of CMOS inverter
22EC2231	Electronics Instruments & Automation	1	Analyze the static and dynamic characteristics of CMOS circuits
		2	Evaluate the performance of CMOS circuits
		3	Design and implement the combinational and sequential circuits using Cadence VLSI Design Full Suite
		4	Apply the fundamental concepts in computer vision and review different feature extraction techniques.
		5	Apply the basic structure of DL models (CNN based) for image data classification.
22EC2232	DEEP LEARNING FOR COMPUTER VISION APPLICATIONS	1	Apply auto encoder algorithms for segmentation.
		2	Analyse deep learning models for finding solutions for problems in computer vision and judge their performance.
		3	Evaluate and Analyze the deep learning operations applied in CVA through Python code development.
		4	Apply the fundamental concepts in computer vision and review different feature extraction techniques.
		5	Apply the basic structure of DL models (CNN based) for image data classification.
22EC2232	DEEP LEARNING FOR COMPUTER	1	Apply auto encoder algorithms for segmentation.

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	VISION APPLICATIONS	2	Analyse deep learning models for finding solutions for problems in computer vision and judge their performance.
		3	Evaluate and Analyze the deep learning operations applied in CVA through Python code development.
		4	Apply the behavior of high frequency components and intreprete RF and Microwave Circuit using Scattering parameters.
		5	Interpret different types of RF filters and its design considerations.
22EC2233	RF SYSTEM DESIGN	1	Analyze Stability Considerations and Stabilization methods of RF Amplifiers using Small Signal Analysis and configure basic RF Oscillator circuit.
		2	Analyze RF Receiver circuit design, its optimization techniques and real time applications.
		3	Design and analyze RF Electronic Circuits design through project-based learning using modern tools.
		4	Explore different frequency bands used in wireless communication and study Propagation Mechanisms.
		5	Analyze Mobile Radio channel characterization with focus on signal variations.
22EC2234	Radio Wave Propagation	1	Interpret tropospheric effects and ionospheric effects on radio wave propagations.
		2	Analyze wave Propagations in Underwater by analyzing acoustic waves.
		3	Analyze various Spectrum bands of wireless communication and study different types of fading with various communication protocols.


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		4	Interpret the basics of network threats and attacks
		5	Interpret network security Protocols and technologies
22EC2235	Network Security	1	Interpret Internet security protocols
		2	Interpret Network authentication Protocols
		3	Apply the network security protocols on simulation networks using cisco packet tracer or Wireshark
		4	Interpret the basics of network threats and attacks
		5	Interpret network security Protocols and technologies
22EC2236	Electronic Circuits for Medical Instrumentation	1	Interpret Internet security protocols
		2	Interpret Network authentication Protocols
		3	Apply the network security protocols on simulation networks using cisco packet tracer or Wireshark
		4	Understand the functional behaviour of ASICs
22EC2237	ASIC and FPGA Design	1	Realize Full-custom & Semi-Custom design methodologies of ASIC
		2	Analyze the functional operation of Programmable ASIC logic cells
		3	Realize the Programmable ASIC I/O Cells
		4	Design and implement the combinational and sequential circuits using Cadence VLSI Design Full Suite
22EC2238	Peer-To-Peer Networks	1	Demonstrate the client - server networks and their dynamics
		2	Apply and Practice the unstructured networks and their applications
		3	Apply the random walk techniques for peer to peer networks

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		4	Analyse the structured networks and their applications
		5	Analyse the different peer to peer networks
22EC2239	Wireless local Area Networks	1	Apply the knowledge of networks to WLANs and 802.11 WLANs and IP Networking
		2	Analyse Radio transmission capacity, Throughout, Bandwidth, efficiency, Forward error correction
		3	Analyse WLAN switches and MAC Protocols
		4	Analyse IEEE802.11 protocols and frame structure.
		5	Analyse different protocols of WLANs using different topologies Using Cisco Packet tracer
<b>BIOMEDICAL INSTRUMENTATION</b>			
C4072	22E Bio medical Signal and Image Processing	1	Understand the basic concepts related to Biomedical signals and images.
22EC4073	Advanced Biomedical signal processing	1	Apply image enhancement techniques for biomedical Images.
		2	Apply advanced signal processing approaches for biomedical signals and images.
		3	
		4	Analyze the abnormalities of the human physiological condition from Biomedical Signal and Image Pattern.

  
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		5	Analyze and implement appropriate signal/Image processing algorithms for practical problems involving biomedical signals and systems Using MATLAB.
22EC4075	Nanotechnology and Nanosensors	1	Summarize the basic concepts of Nanosensors
		2	Interpret the fabrication, characterization of nanosensors
		3	Apply nanomaterials to manipulate nanosensors
		4	Apply quantum dots in Sensing and Imaging Application.
		5	Apply Biosensor Design, Nanosensor Design and Application of Quantum Dots in nanotechnology
22EC4076	Biosensing and Bioelectronics	1	Summarize the working principles of biosensors
		2	Interpret characterization of optical and electrochemical sensors
		3	Apply the response of biosensors
		4	Analyse selective biomedical devices for future applications
		5	Design and interfacing of Biological Systems with electronic systems, non-conventional bioelectronic devices using SPICE/OFDTD/COMSOL
<b>DATA COMMUNICATION</b>			
22EC4051	4G Wireless Technologies and Cellular Communication	1	Interpret the Spreading Sequences and Multiuser systems and systems for packet evolution
		2	Demonstrate the Multi carrier modulations using OFDM
		3	Extrapolate the MIMO systems and its eigenmode channels
		4	Analyse the Ultra-Wide Band technologies and challenges
		5	Analyse LTE and OFDM transmission in deep radio

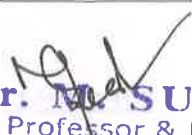
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22EC4052	Modern Satellite Communication Systems	1	Analyze the atmospheric impairments and mitigation techniques to enable earth-space communication.
		2	Analyze satellites application in enabling the 5G ecosystem.
		3	Analyze the mission requirements and simulate complex ground, sea, air, and space platform analyses in an integrated environment.
		4	Interpret the evolution of LTE systems in enabling 5G infrastructure and its Multicarrier Modulation schemes to achieve high throughput.
		5	Interpret the importance of massive MIMO technologies to enable channel capacity for high throughput communications.
22EC4053	5G Wireless Technologies	1	Apply propagation characteristics and Analyze millimeter-wave transceiver architecture, modulation schemes for enabling high throughput indoor and outdoor communications.
		2	Analyze 5G use-case scenario in enabling communication for Autonomous Vehicles.
		3	Analyze the 5G architecture and call process with 3GPP standards using 5G mobile network.
		4	Design and Analyze the QoS requirements with respective use-case scenario to enable information exchange between devices with hardware realization.
		5	Interpret the evolution of LTE systems in enabling 5G infrastructure and its Multicarrier Modulation schemes to achieve high throughput.
22EC4054	Optical Wireless communications	1	Interpret the behavior of wireless optical channel and its scattering parameters.

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		2	Apply various channel models for estimation of losses in optical wireless communication.
		3	Analyze and interception of modulation techniques utilized in VLC.
		4	Analyze the application of optical source detectors
		5	Interpret the behavior of wireless optical channel and its scattering parameters.
22EC4055	Machine Learning for Wireless Communications	1	Apply Deep Learning–Based wireless network coverage to enhance capacity, throughput.
		2	Interpret Machine Learning to Optimize the Energy Efficiency of wireless networks.
		3	Interpret Machine Learning–Based Adaptive Modulation and Coding (AMC) Design
		4	Interpret Machine Learning for Joint Channel Equalization and Signal Detection
		5	Analyze Wireless Communication Techniques using Deep Learning and Machine Learning
<b>INTELLEAGENT MULTIMEDIA PROCESSING</b>			
22EC3081	Natural Language Processing and Applications	1	Understand the concept of embedded systems and multicore System on chip.
		2	Identify the various communication interfaces and protocols for efficient embedded system and also the interconnection networks.
		3	Development of Software Tools and Debugging Techniques
		4	Apply the concept of multicore SoC in building real time applications

  
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		5	Analyse the programming of LPC2148 microcontroller and also interface various peripheral devices to the LPC2148 microcontroller
22EC3082	Data Engineering	1	Illustrate and summarize the basic structure of data Pipelines.
		2	Analyze the performance of algorithms for building a 311 data pipeline and prioritize them for the existing applications.
		3	Apply Data pipelines for deployment in production using Apache Sparak and PySpark and judge their performance.
		4	Implement Data processing algorithms and Information retrieval techniques on standard database systems concepts using python.
22EC3083	Bio Medical Signal and Image Analysis	1	Understand the Basic concepts related to Biomedical signals and images
		2	Understand the Bio medical signal processing methods to eliminate the artefacts arise in biomedical signals
		3	Understand the Biomedical imaging and enhancement techniques
		4	Apply signal processing approaches for biomedical signals and images
		5	Apply biomedical signal and image processing techniques
22EC3084	Data visualization	1	Build data wrangling models with data science libraries like NumPy and Pandas
		2	Applying various data visualization tools to explore the data
		3	Understand Data science, data collection, and data pre-processing

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		4	Applying descriptive statistical sampling techniques to explore the
22IMP3505	Multimedia Processing	1	Understanding Emerging standards for multimedia applications
		2	Applying Image Processing Techniques for Multimedia Processing
		3	Applying Intelligent Multimedia Processing
		4	Analysis On Independent Component for Multimedia Signals
		5	Demonstrate 2-D & 3-D Animation Process
22EC3086	Introduction to quantum computing	1	Analyse quantum computing lab using matlab/Python
		2	Analysis of different microware components and devices
		3	Apply S parameters and Analysis of differnt microware components
		4	Apply S parameters and Analysis of microwave filters and periodic structures

**RF AND MICROWAVE**

21EC3091	Microwave Engineering	1	Interpret the applications of microwave and millimetric wave circuits
		2	Apply the radiation concept and Analyze of different antennas
		3	Analyze the various antenna types and arrays
		4	Analyze the VSWR and Impedance measurements for different antennas
21EC3092	Advanced Antenna Design for wireless and 5G applications	1	Interpret real-world applications of various antennas.
		2	Apply the basic principles of communications to build a radar system
		3	Analyze the MTI radars
		4	Analyze different radar systems
21EC3093	Modern Radar systems & Navigational Aids	1	Understand the principles Navigation system
		2	Understand and analysis of modern antenna design

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		3	Apply the concepts of mm waves for meteorological applications.
		4	Design and analyze mm wave circuits.
21EC3095	Electronic Warfare, EMI & EMC	1	Analyze the applications of modern antennas and mm wave radar.
		2	Understand the basic concept of Electronic Warfare
		3	Intrepret the different Jamming techniques and its methodologies
		4	Interpret the concept of design of EMC and components
		5	Analyse, design and testing of EMI and EMC
<b>EMBEDDED SYSTEMS &amp; IOT</b>			
21EC3051	Wireless sensor Networks & IOT Applications	1	Understanding of wireless sensor network technologies
		2	Study of BLE protocols in WSN security and power applications.
		3	Study and application of IOT and WSN for smart cities/ villages.
		4	Study of various IoT application in various domains
21EC3052	Solar Photo-Voltaic cells & Solar Power Arrays	1	Apply the fundamentals, structure, and characteristics of photovoltaics to test the performance of the solar cell.
		2	Analyze the SPV materials and production of SPV cells with different methodologies
		3	Apply design concepts and develop the reliable SPV with testing and optimization techniques.
		4	Analyse the SPV arrays, configurations with AI and ML.
		5	Apply the concept of Renewable Energy with solar power and electronic power converters.
21EC3053	Electronic Systems for Renewable Energy & Smart Grid	1	Apply the electronics system concept for renewable energy sources with different sensors and data management

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		2	Analyse the Concept of smart grid sub system and circuits
		3	Analyse Smart grid to IOT applications with smart grid security, communication and power system
		4	Understand the basics of smart cities/villages/living
21EC3054	IOT Applications for Smart Cities	1	Study of systems for smart cities with case studies.
		2	Analysis and design of smart grid sub-systems and circuits
		3	Study of advanced topics related to privacy, scaling and design considerations.
		4	Understanding the systems and smart systems with local requirements issues and solutions
<b>VLSI</b>			
22EC3016	Low Power VLSI	1	Understand the power dissipation in MOS structure
		2	Illustrate probabilistic power analysis and apply low power techniques at circuit level for CMOS circuits
		3	Apply low power techniques for various combinational circuits.
		4	Design and analysis of low power techniques for memories.
		5	Understanding of computational and automation tools
21EC3062	Algorithms for VLSI Design Automation	1	Understanding of VLSI layout modeling
		2	Understand and analysis of hardware models
		3	Analysis and understanding the FPGA technologies
		4	Study and design of combinational and sequential circuits using PLDs and state machines.
		5	Understand Full-custom & Semi Custom design methodologies of for designing different PLD architectures.

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22EC3017	ASIC and FPGA Chip Design	1	To study PLD structures and design process. Study of different CPLD and FPGA architectures
		2	To understand different physical process.
		3	Understand the design flow and methodologies of VLSI sub- system
		4	Study of memory and array sub systems
21EC3064	VLSI Sub-system Design and Design for Testability	1	Analysis of fault tolerant designs
		2	Design of testing of VLSI systems
		3	Demonstrate the basics of non-volatile memories and its applications
		4	Interpret the advanced random access memories and few basics of solar cells and supercapacitors
		5	Apply the concepts of micro machining process to MEMS Devices
21EC3065	Semiconductor Memories & MEMS	1	Analysis the memory fault models and testing process
		2	Revisit the Basic functionality and Electrical Properties of MOS Devices and apply the properties to determine the gain of amplifiers
		3	Perform analysis on passive & active current mirrors and switched capacitor technique.
		4	Illustrate design procedure of static and dynamic CMOS circuits and sequential logic gates and clock synchronization to design an efficient circuit for the given logic
		5	Illustrate the design procedure of arithmetic building blocks and memories.
<b>ROBOTICS &amp; AUTOMATION</b>			
21EC3071	Control Systems & Introduction to Robotics	1	Apply the concepts of control systems and analyse their static and dynamic conditions
		2	Apply the time, frequency analysis and system design

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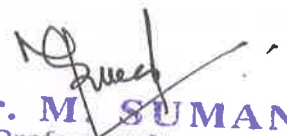
		3	Analyse the components of robotic systems and apply to construction of simple robots.
		4	Apply the fundamentals of kinematics to analyze the dynamic control in robotic design.
		5	Apply the foundations of autonomous vehicle technologies and its basic terminologies
22EC3072	Autonomous Vehicles & Automotive Electronics	1	Analyze the essential principles of sensors and actuators used for automotive
		2	Discover the fundamental principles of automotive electronic control systems
		3	Illustrate the case studies on autonomous vehicles and automotive electronics.
		4	Apply the fundamentals of robotic sensors and motions in robotics
22EC3073	Advanced Robotics	1	Analyse the position and displacement of joints for different input conditions.
		2	Illustrate different robotic mechanisms and describe their usefulness in automation.
		3	Demonstrate specific case studies with respect to robotic applications
		4	Examine the fundamental concepts related to multi-dimensional signal processing and describe their usefulness in computer vision applications.
22EC3075	Computer Vision & Applications	1	Inspect various image representation models and examine their characteristics.
		2	Analyze various motion estimation models in video data and criticize their performance.
		3	Illustrate various machine learning models for computer vision applications and test their performance.

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		4	Interpret the fundamental concepts of Human-Machine Interfaces and analyze their usefulness in interactive system design.
22EC3074	Human Machine Interface & Brain Machine Interface	1	Apply the knowledge generated in the development of HCI models and illustrate their design paradigms.
		2	Analyze the brain control interface models and categorize their importance in understanding human performance.
		3	Interpret the BCI/HMI application designs and estimate their value in real world machine interactions.
		4	Analyze fundamental building blocks for automated system development and show design parameters.



Academic Professor I/C



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