



## Program Outcomes of B.E (ECE) Program

1. Engineering Knowledge	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems
2. Problem Analysis	Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
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 public health and safety, and cultural, societal, and environmental considerations.
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.
5. Modern Tool Usage	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.
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.
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.
8. Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and Teamwork	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. Communication	Communicate effectively on complex engineering activities with the engineering community and with the 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.
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.
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.

HEAD

DEPARTMENT OF ECE

Chaitanya Bharathi Institute of Technology  
Hyderabad - 500 075

**VISION and MISSION of the INSTITUTE**

**Vision**

To be a centre of excellence in technical education and research.

**Mission**

To address the emerging needs through quality technical education and advanced research.

**VISION and MISSION of DEPT. of ECE**

**Vision**

To develop the department into a full-fledged center of learning in various fields of Electronics & Communication Engineering, keeping in view the latest developments.

**Mission**

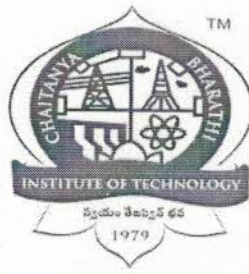
To impart value based technical education and train students and to turn out full pledged engineers in the field of Electronics & Communication Engineering with an overall background suitable for making a successful career either in industry/research or higher education in India/Abroad.

**Program Educational Objectives of B.E(ECE) Programme**

- PEO1 Student will excel in analysing, design and development of systems in the area of Electronics and Communications.
- PEO2 Student will have hand on experience in executing software related applications pertaining to Electronics and Communication Engineering.
- PEO3 Student will carry out research in new technologies with modern relevant tools.
- PEO4 Student will develop with professional ethics, effective communication skills and knowledge of societal impacts of computing technologies.

**Program Specific Outcomes of B.E(ECE) Programme**

- PSO1 Student will demonstrate the knowledge and understanding of basic principles of mathematics, science, electronic devices, networks and signal processing procedures in simulation, modelling, and describing the behaviour of analog and digital electronic circuit or system.
- PSO2 Student will be able to select and apply appropriate techniques, resources and Hardware and Software tools for design, analysis and testing the various analog and digital electronic circuits and networks.
- PSO3 Student will demonstrate self-confidence to work independently or in a team and his/her ability to Analyze, synthesize, design and test analog & digital components, process, system or sub-systems of electronics and communication Engineering used in peace as well as war applications as per the specifications.



# CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

*OUR MOTTO: SWAYAM TEJASWIN BHAVA*

## R-20 Regulation

<b>Institute Vision</b>	To be a centre of excellence in technical education and research.	
<b>Institute Mission</b>	To address the emerging needs through quality technical education and advanced research.	
<b>Department Vision</b>	To emerge as a vibrant model of excellence in education, research and innovation in Electronics and Communication Engineering.	
<b>Department Mission</b>	M1	To impart strong theoretical and practical knowledge of the state of art technologies to meet growing challenges in the industry
	M2	To carry out the advanced and need based research in consultation with the renowned research and industrial organizations
	M3	To create entrepreneurship environment including innovation, incubation and encourage to patent the work
<b>PEO 1</b>	Engage successfully in professional career and/or pursue higher education in Electronics and Communication and allied areas.	
<b>PEO 2</b>	Pursue research, design and development of state-of-the art systems applying the knowledge of Electronics and Communication Engineering	
<b>PEO 3</b>	Begin start-ups and involve in entrepreneurship activities by adopting changing professional and societal needs.	
<b>PEO 4</b>	Exhibit professional ethics and values with lifelong learning and work effectively as individuals/team members in multidisciplinary projects.	
<b>PSO 1</b>	Ability to apply the acquired knowledge of core subjects in design and development of Communications/Signal processing/ VLSI/ Embedded systems.	
<b>PSO 2</b>	Analyze and solve the complex Electronics and Communication Engineering problems using state-of-the art hardware and software tools	
<b>PSO 3</b>	Develop innovative technologies for Entrepreneurship based on the research outcomes of Electronics and Communication Engineering.	

  
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# CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

## INSTITUTE VISION AND MISSION

### VISION

To be a centre of excellence in technical education and research.

### MISSION

To address the emerging needs through quality technical education and advanced research.

## DEPARTMENT VISION AND MISSION

### VISION

To emerge as a vibrant model of excellence in education, research and innovation in Electronics and Communication Engineering.

### MISSION

- To impart strong theoretical and practical knowledge of the state of art technologies to meet growing challenges in the industry
- To carry out the advanced and need based research in consultation with the renowned research and industrial organizations
- To create entrepreneurship environment including innovation, incubation and encourage to patent the work

## PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

1. Engage successfully in professional career and/or pursue higher education in Electronics and Communication and allied areas.
2. Pursue research, design and development of state-of-the art systems applying the knowledge of Electronics and Communication engineering
3. Begin start-ups and involve in entrepreneurship activities by adopting changing professional and societal needs.
4. Exhibit professional ethics and values with lifelong learning and work effectively as individuals/team members in multidisciplinary projects.

## PROGRAM SPECIFIC OUTCOMES (PSOs)

1. Ability to apply the acquired knowledge of core subjects in design and development of Communications/Signal processing/ VLSI/ Embedded systems.
2. Analyze and solve the complex Electronics and Communication engineering problems using state-of-art hardware and software tools
3. Develop innovative technologies for Entrepreneurship based on the research outcomes of Electronics and Communication engineering.

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# CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)

Gandipet, Hyderabad-75

Department of Electronics and Communication Engineering

Course outcomes statements for BE(ECE) - R18

IV Year

S.NO	Subject code	Name of subject	Course Outcomes Statements
1	18EC C26	<b>COMPUTER NETWORKS</b>	Relate the communication tasks with basic concept of networking, protocols and Service models at different layers.
			Interpret the principle and function of each layer using protocols and services.
			Model a network for random accessing to route the packets.
			Examine the performance of network with routing algorithms and the congestion control approaches.
			Explain the importance of protocols in each layer and layering concepts.
2	18EC C27	<b>VLSI DESIGN</b>	Model a digital design using Advanced Verilog HDL constructs.
			Analyse the characteristic behaviour of MOSFET and discuss CMOS circuit Design Process
			Explain various process steps involved in IC fabrication.
			Design various NMOS and CMOS based logic circuits.
			Discuss the concepts of subsystem designs and Testing.
3	18EC E15	<b>CRYPTOGRAPHY AND BLOCKCHAIN TECHNOLOGY</b>	Comprehend the key concepts of fundamental cryptography techniques which are required for Blockchain Technology.
			Describe the key concepts and compare various models of Blockchain Technology.
			Understand consensus mechanism in Blockchain.
			Acquire knowledge regarding cryptocurrency transactions and their validation.
			Apply the concepts of Blockchain technology in real world scenario.
4	18EC E16	<b>DSP PROCESSORS AND ARCHITECTURES</b>	Classify the differences between DSP Processor and General-Purpose processor.
			Understand the basic architectural needs of Programmable DSPs
			Explain the architecture features of TMS320C55XX processor.
			Develop on interface with TMS320C55XX processor to external peripherals.
			Design and implement of various signal processing algorithms using 55xx processor
5	18ECE17	<b>PRINCIPLES OF COMPUTATIONAL ELECTROMAGNETICS</b>	Understand the basic concepts of computational Electromagnetics
			Interpret the variational methods.
			Apply the process of moment methods using appropriate weighing functions
			Devise Quasi Static, Scattering and Radiation problems using Method of Moments.
			Solve the Laplace's equation, Poisson's equation and wave equations using finite element methods

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6	18EC E18	<b>SEMI CONDUCTOR MEMORY DESIGN AND TESTING</b>	Comprehensive Understanding of Static Random-Access Memory (SRAM) and Dynamic Access Memory (DRAM).
			Design of Non-Volatile Memory Architectures and their future comparison.
			Applying the memory Fault modelling and memory for testability.
			Analyze the Memory Fault Modelling, Testing of memory design.
			Enhance the advanced memory technologies and packaging technologies
7	18ECE19	<b>SPEECH PROCESSING</b>	Understand the basic characteristics of speech signal in relation to production and hearing of speech by humans.
			Analyze speech and extract features for speech applications.
			Design the various applications like recognition, synthesis, and coding of speech.
			Make use of HMM for speech recognition.
			Implement dynamic warping technique in real time problems
8	18ECE20	<b>CMOS RF IC DESIGN</b>	Define the characteristics RF systems, Tuned circuits, LNA, Mixers.
			Understand the behaviour of RF systems, Reflection Coefficient and Noise in RF Systems.
			Apply the concepts of noise and reflection coefficient to characterize RF Systems.
			Analyse different Wideband Amplifiers, LNA, Mixers and Power Amplifiers.
			Design and Development of LNA, Power amplifier, PLL
9	18ECE21	<b>DIGITAL IMAGE PROCESSING</b>	Describe basic concepts of image processing system.
			Summarize and compare various digital image transform techniques.
			Demonstrate and survey digital image enhancement in practical applications.
			Analyse the case study related to various techniques of image restoration.
			Apply compression techniques on digital image
10	18ECE22	<b>EMBEDDED SYSTEMS</b>	Understand the fundamentals of the embedded systems
			Analyze the hardware and software details of the embedded systems.
			Design interfacing of the systems with other data handling / processing systems.
			Evaluate the performance of an embedded system using various debugging tools.
			Apply embedded design approach for various applications.
11	18ECE23	<b>SOFTWARE DEFINED RADIO</b>	Understand and compare the Super-heterodyne receiver, SDR and CR.
			Analyze the basic architecture of SDR
			Determine the processor based on the application.
			Evaluate and choose the various spectrum sensing methods based on application.
			Choose the USRP and WARP boards based on the facilities required for a SDR application.
12	18EC E24	<b>5G COMMUNICATIONS</b>	Recall the requirements and used cases of 5G technology.
			Illustrate the architecture of 5G.
			Apply the 5G concepts to D2D communications.

			Compare various Radio-Access Technologies.
			Explain the concept of massive MIMO
13	18CE002	<b>DISASTER MITIGATION AND MANAGEMENT</b>	Identify and understand the fundamental terminologies in disaster management.
			Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non- structural mitigation measures.
			Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
			Analyze various mechanisms and consequences of human induced disasters.
			Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.
14	18ME 004	<b>ENTREPRENEURSHIP</b>	Understand the concept and essence of entrepreneurship.
			Identify business opportunities and nature of enterprise.
			Analyze the feasibility of new business plan.
			Apply project management techniques like PERT and CPM for effective planning and execution of projects.
			Use behavioural, leadership and time management aspects in entrepreneurial journey
15	18CS 006	<b>FUNDAMENTALS OF DBMS</b>	Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS. Design the database logically using ER modeling
			Outline the schema of the relational database and key constraints: Develop queries using DDL, DML and DCL of SQL.
			Identify the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
			Summarize the concepts of dense, sparse, ISAM and B+ tree indexing and get familiar with states and properties of transactions.
			Interpret the locking, time stamp, graph and validation-based protocols for concurrency control.
			Summarize log-based recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transactions
16	18IT 002	<b>PYTHON PROGRAMMING</b>	Understand the fundamental concepts and control structures of python programming.
			Write user defined iterative & recursive functions, identify appropriate predefined functions and perform file handling Operations.
			Use suitable data structures such as sequences, dictionaries and sets in python programming.
			Apply concepts of OOP, exception handling and build regular expressions using Python.
			Design and Develop GUI based applications and visualize the data
17	18EGO01	<b>TECHNICAL WRITING SKILLS</b>	Understand the channels of communication and define nature and aspects of Technical communication
			Compare and contrast technical communication to that of general communication while constructing error free sentences

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			<p>applying features of technical writing.</p> <p>Analyze data, draw inferences to write Journal articles and conference papers and to compose business letters.</p> <p>Evaluate data to draft technical reports and technical proposals.</p> <p>18Design a technical presentation by understanding the nuances of presentation skills and also transfer data from verbal to graphic and vice versa</p>
18	18EC C28	<b>COMPUTER NETWORKS LAB</b>	<p>Apply fundamental principles of computer networking.</p> <p>Examine the performance of design issues of Link layer.</p> <p>Construct a network and measure its performance with different routing algorithms.</p> <p>Create a wired and wireless Network using NS-2.</p> <p>Analyze performance of various Network protocols using NS-2</p>
19	18EC C29	<b>ELECTRONIC DESIGN AND AUTOMATION LAB</b>	<p>Demonstrate the process steps required for simulation /synthesis</p> <p>Develop HDL codes/scripts with appropriate syntax</p> <p>Apply an appropriate modelling style to describe various combinational and sequential circuits in Verilog HDL</p> <p>Examine the successful execution of the codes/ schematic using various Simulation Tools</p> <p>Build various digital circuits on hardware boards like FPGA.</p>
20	18EC C30	<b>ELECTRONICS MEASUREMENT AND SIMULATION LAB</b>	<p>Understanding of the operational features of various analog and digital test and measurement equipment.</p> <p>Analysis of various standard bridges and ability to measure temperature</p> <p>Learn how to develop basic applications in the LabVIEW graphical programming environment.</p> <p>Develop ability for programming in LabVIEW using various data structures, program structures, plotting the graphs and charts for system monitoring, processing and controlling.</p> <p>Apply knowledge of mathematics and engineering to formulate and study or solve engineering problems, including problems at the interface of engineering</p>
21	18EC C31	<b>PROJECT:PART - 1</b>	<p>List the various approaches to the selected problem.</p> <p>Interpret the advantages and disadvantages of various approaches.</p> <p>Apply the selected approach for simulating / modelling / designing the problem.</p> <p>Analyse and write a report on the results of the simulation / modelling of the problem selected.</p> <p>Justify and present the results of the simulation / model / design before the departmental committee.</p>
22	18EC C32	<b>INDUSTRIAL VISIT</b>	<p>Know the importance of visiting an engineering industry from the point of view of process of manufactory procedures and setup.</p> <p>Summarize the required information with regard to materials, source of supply in respect to the product.</p> <p>Know the stages in manufactory of a product.</p> <p>Prepare the 'industry visit' technical report covering the details of visit and its importance.</p> <p>Visualize the safety precautions to be followed in industry, confidentiality of the product processing as the man power required.</p>



23	18ECE25	<b>IOT AND ITS APPLICATIONS</b>	Understand the terminology, enabling technologies and applications of IoT
			Apply the concept of M2M and understand the basics of modern networking with the concepts of SDN and NFV.
			Understand the basics of Python Scripting Language which is used in many IoT devices.
			Describe the steps involved in IoT system design methodology.
			Design simple IoT systems using Raspberry Pi board with sensors, actuators and develop web applications using python-based framework called Django.
24	18ECE26	<b>PRINCIPLES OF GNSS</b>	Demonstrate the fundamental concepts of communications in understanding of GPS architecture, operation and signal structure.
			Apply the principles of orbital mechanics, time references, coordinate systems and range measurements in estimating user position.
			Examine the effect of various error sources and satellite geometry on position estimates and analyze the suitability of a given data format.
			Compare the architecture and working of other GNSS systems and make use of GNSS systems in a variety of civilian and defense applications.
			Relate the knowledge of DGPS techniques in understanding augmentation systems.
25	18ECE27	<b>PRINCIPLES OF WIRELESS SENSOR NETWORKS</b>	Recall the features, characteristics, Technology, Data transmission, protocols and design issues of wireless Sensor networks.
			Illustrate the function of Network architecture, Routing, Protocol structure, and node problems
			Apply the appropriate protocols and routing algorithms to solve issues in Network.
			Analyze data processing, aggregation and routing, Protocol overheads, Throughput, Security challenges in a WSN.
			Compare the performance of WSN in terms of topologies, technology, protocols, design principles, and security
26	18ECE28	<b>REAL TIME OPERATING SYSTEMS</b>	Understand Real-time operating system requirements and applications.
			Categorize different scheduling approaches for real time scheduler.
			Differentiate various RTOS features and POSIX standards
			Analyze the inter task communication in RTOS.
			Apply the Linux based embedded system design process
27	18CS007	<b>BASICS OF CYBER SECURITY</b>	List the different types of cybercrimes and analyze legal frameworks to handle cybercrimes.
			Identify the Tools and Methods used in cybercrimes.
			Analyze and resolve cyber security issues and laws governing Cyberspace.
			Describe the need of Digital Forensics and the importance of digital evidence in prosecution.
			Interpret the commercial activities in the event of significant information security incidents in the Organization.
28		<b>GENDER</b>	Understand the difference between "Sex" and "Gender" and be able to explain socially constructed theories of identity.

	<b>18EGO02</b>	<b>SENSITIZATION</b>	<p>Recognize shifting definitions of "Man" and "Women" in relation to evolving notions of "Masculinity" and "Femininity".</p> <p>Appreciate women's contributions to society historically, culturally and politically.</p> <p>Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.</p> <p>Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.</p>
29	<b>18PY 001</b>	<b>HISTORY OF SCIENCE AND TECHNOLOGY</b>	<p>Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.</p> <p>Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.</p> <p>Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.</p> <p>Make use of the advancements in the field of science and technology by adopting new philosophies of 19<sup>th</sup> and first half of 20<sup>th</sup> century in finding ethical solutions to the societal problems.</p> <p>Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20<sup>th</sup> century onwards.</p>
30	<b>18CS 010</b>	<b>MACHINE LEARNING USING PYTHON</b>	<p>Define the basic concepts related to Python and Machine Learning</p> <p>Describe the feature engineering methods, regression techniques and classification methods</p> <p>Apply Python packages for data visualization. text and time series data analysis using NLP toolkit</p> <p>Evaluate and interpret the results of the various machine learning techniques</p> <p>Solve real world problems using deep learning framework</p>
31	<b>18ME 001</b>	<b>ROBOTICS</b>	<p>Describe the basic components, specifications and applications of the Robots.</p> <p>Understand transformations, direct and inverse kinematics of robots.</p> <p>Calculate forces in links and joints of a robot and find the singularities, Jacobian and trajectory planning of a robot for various tasks.</p> <p>Classify drives, sensors and grippers for various applications.</p> <p>Program a robot to predict motions for a given task with machine vision and sensors.</p>
32	<b>18EC C33</b>	<b>TECHNICAL SEMINAR</b>	<p>Collect, Organize, Analyze and Consolidate information about emerging technologies from the literature.</p> <p>Exhibit effective communication skills, stage courage, and confidence.</p> <p>Demonstrate intrapersonal skills.</p> <p>Explain new innovations/inventions in the relevant field.</p> <p>Prepare and experience in writing the Seminar Report in a prescribed format.</p>
33	<b>18ECC34</b>	<b>PROJECT: PART-2</b>	Recall the details of the approach for the selected problem.

			Interpret the approach to the problem relating to the assigned topic.
			Determine the action plan to conduct investigation.
			Analyze and present the model / simulation /design as needed.
			Evaluate, present and report the results of the analysis and justify the same


  
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# Course outcomes statements for BE (ECE) – R20

## III Year

S.No	Subject code	Name of subject	Course Outcomes Statements
1.	20ECC01	<b>ELECTROMAGNETIC THEORY AND TRANSMISSION LINES</b>	Comprehend mathematically the coordinate systems and solve simple static Electromagnetic problems using various laws and theorems.
			Understand Maxwell's equations in different forms (differential and integral) and apply them to diverse engineering problems.
			Demonstrate the Electromagnetic wave properties with respect to different transmission mediums.
			Predict the behavior of reflection and refraction of the waves in different mediums.
			Estimate the transmission line properties, reflection, and matching concepts.
2.	20ECC02	<b>ELECTRONIC DEVICES</b>	Demonstrate understanding of the characteristic behaviour of various electronic devices such as Diodes, Transistors etc.
			Apply the acquired knowledge in the analysis of various diode and Transistor circuits.
			Compare and Contrast the characteristics of BJT and FET in various configurations.
			Evaluate the performance parameters of various diode circuits (rectifiers, clippers and clampers) and Transistor circuits.
			Choose an appropriate electronic device for a specific application and discuss IC fabrication process.
3.	20ECC03	<b>NETWORK THEORY</b>	Recall basics of electrical circuits with nodal and mesh analysis.
			Illustrate electrical theorems for AC and DC Circuits.
			Develop time domain and frequency domain analysis for circuits.
			Analyze the electrical network and two port network parameters for different applications i.e., magnetic coupled circuits, Filters.
			Synthesize different network functions using Foster and Cauer form.
4.	20ECC04	<b>SIGNALS AND SYSTEMS</b>	Classify signals, systems and analyse the signals using Transform techniques.
			Evaluate signal characteristics using time and frequency domain analysis.
			Assess the system stability and causality using ROC and Pole-Zero Plot.
			Describe the sampling process and analyse the DT Signal/systems using DTFT and Z-Transform.
			Apply the Convolution and correlation concepts for analysis of Signal and systems.
5.	20ECC05	<b>ELECTRONIC DEVICES LAB</b>	Demonstrate the characteristic behaviour of PN junction diode, Zener diode and special purpose semiconductor diodes.
			Design various non-linear wave shaping circuits using diodes for a given specification.
			Analyse the behaviour of non-linear wave shaping circuits using diodes.
			Examine the characteristics of BJT and FET in various configurations.
			Evaluate and compare the significant parameters obtained from the characteristics of BJT and FET.

6.	20ECC06	<b>ELECTRONIC WORKSHOP AND NETWORKS LAB</b>	Identify and measure the passive and active components using electronic equipment.
			Apply Network theorems to AC and DC Circuits.
			Determine and analyze two port network parameters.
			Design and verification of attenuators and filters.
			Simulation of different networks and circuits using the simulation software.
7.	20ECI01	<b>MOOCs/Training/Internship</b>	Understand Engineer's responsibilities and ethics
			Use various materials, processes, products and quality control
			Provide innovative solutions to solve real world problems
			Acquire knowledge in technical reports writing and presentation
			Apply technical knowledge to real world industrial situations
8.	20ECC07	<b>ANALOG CIRCUITS</b>	Recall and relate the knowledge of BJT and FET behavior in the design of various biasing and amplifier circuits.
			Apply low and high frequency models of transistor in the analysis of single stage and multistage amplifiers.
			Design and analyze amplifier and oscillator circuits.
			Compare and Contrast different types of biasing, Multistage, Feedback and Power amplifiers.
			Interpret a given analog circuit and evaluate its performance parameters by applying acquired knowledge.
9.	20ECC08	<b>ANALOG COMMUNICATION</b>	Infer the various linear modulation schemes.
			Understand the concept of various angle and pulse modulation schemes
			Design various transmitters and receivers.
			Assess a random signal by computing various statistical properties.
			Evaluate the performance of analog communication system through the estimation of noise.
10.	20ECC09	<b>ANTENNAS AND WAVE PROPAGATION</b>	Understand the basic parameters of an antenna.
			Extend current distribution concept in order to estimate the field patterns.
			Appraise the concepts of broad side and end fire arrays.
			Understand the working principle and characteristics of various antennas.
			Study the behavior of radio waves in various modes of wave propagation.

  
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11.	20ECC10	CONTROL SYSTEMS	Distinguish the closed-loop control systems from open-loop control systems and develop mathematical models in time domain (differential equations, state equations) and S-domain (Transfer function using Laplace transform).
			Evaluation of transfer function from block diagram and signal flow graph by using block diagram reduction techniques and Mason gain formula, respectively.
			Investigate the stability of control system via Routh-Hurwitz criteria, Root-locus method and Nyquist Plot.
			Utilize standard test signals to analyze the time response of first and second-order control systems and frequency response analysis of the control system.
			Design and develop various controllers and compensators to control the steady state error, stability and transient response.
12.	20ECC11	DIGITAL SYSTEM DESIGN	Understand the basic concepts related to digital system design.
			Design the combinational and sequential circuits.
			Analyze the behavior of the digital system design.
			Develop the digital system using various Verilog HDL modeling.
			Apply the design concepts of digital system using Verilog HDL.
13.	20ECC12	ANALOG CIRCUITS LAB	Design various BJT/FET biasing circuits to identify the appropriate circuit for faithful amplification.
			Experiment with single stage and multistage BJT/FET amplifiers including large signal amplifiers.
			Compare and contrast different types of feedback topologies.
			Develop and test various oscillator circuits.
			Evaluate and compare the significant parameters obtained from the Frequency response plots of BJT and FET amplifier circuits.
14.	20ECC13	ANALOG COMMUNICATION LAB	Demonstrate the generation and detection of various analog modulated signals.
			Illustrate the sampling concept and interpret the generation and detection of various pulse modulated signals.
			Obtain and Analyze frequency response of Pre-Emphasis and De Emphasis circuits
			Experiment with Mixer, Radio receiver and PLL characteristics, FDM and TDM.
			Estimate the Power spectral density of noise and SNR and analyze the spectra of AM and FM signals.
15.	20ECC14	DIGITAL SYSTEM DESIGN LAB	Design a Digital circuit using Verilog HDL.
			Understand various abstraction levels of a digital design.
			Verify the functionality of a design using Test bench.
			Simulate and synthesize combinational logic circuits.
			Simulate and synthesize sequential logic circuits.
16.	20EC C15	COMPUTER ARCHITECTURE AND MICROPROCESSORS	Apply fixed and floating-point arithmetic algorithms.
			Understand how the computer works.
			Classify different organizations of CPU and I/O.

			Compare various memories and memory access techniques.
			Understand the architecture and instruction set of a microprocessor.
17.	20EC C16	<b>DIGITAL COMMUNICATION</b>	Understand the concept of pulse digital modulation schemes and compare their performance.
			Interpret the concept of information theory and apply source coding schemes.
			Demonstrate various error control schemes and develop the encoding and decoding techniques to detect and correct the errors.
			Analyze different digital modulation schemes and can compute the bit error performance.
			Identify and apply spread spectrum modulation techniques.
18.	20EC C17	<b>DIGITAL SIGNAL PROCESSING</b>	Apply the concept of DFT and FFT for signal processing applications.
			Implementation of IIR filters for the given specifications.
			Design FIR filters for the given specifications.
			Interpret the concepts of Multi-rate digital signal processing and its applications.
			Understand the architecture features of TMS320C67XX processor
19.	20EC C18	<b>LINEAR AND DIGITAL INTEGRATED CIRCUITS</b>	Understand the basic construction, characteristics and parameters of Op-Amp.
			Analyze the linear and nonlinear applications of Op-Amp.
			Explain the concepts of IC555 timer, IC723 regulator, memories and PLD.
			Classify and describe the characteristics of different logic families
			Design logic functions of Combinational and Sequential circuits with ICs.
20.	20EC E01	<b>CAD for VLSI verification</b>	Justify the importance and use of CAD tools.
			Differentiate design flow for different types of ASIC.
			Understand the design flows of CADENCE Virtuoso, CADENCE NCLaunch and XILINX ISE
			Understand the importance of design for testability
			Differentiate various type of simulators.
21.	20EC E02	<b>OPTICAL COMMUNICATION</b>	Select necessary components required in modern optical communications systems.
			Analyze various distortions in optical fibers.
			Distinguish the various Optical sources and Optical detectors.
			Examine the Power Launching and Coupling and fiber optical receiver.
			Determine the performance of Optical Communication link.

22.	20EC E03	<b>SIGNAL DETECTION TECHNIQUES</b>	Apply and analyse discrete random process concepts in communications.
			Understand binary hypothesis techniques
			Analyse the various statistical decision techniques.
			Demonstrate the various binary detection techniques and M-ary detection.
			Evaluate various CFAR detectors.
23.	20EC E04	<b>EMBEDDED C PROGRAMMING</b>	Analyze the various functions used in embedded C programming
			Understand the evaluation of Arduino family and its development board details
			Interface the sensors and various i/o devices to embedded development board
			Apply the concepts of IoT to embedded development board
			Demonstrate and design embedded C based applications.
24.	20EC E05	<b>SOFTWARE DEFINED RADIO</b>	Understand and compare the Super-heterodyne receiver, SDR and CR.
			Analyze the basic architecture of SDR
			Determine the processor based on the application.
			Evaluate and choose the various spectrum sensing methods based on application.
			Choose the USRP and WARP boards based on the facilities required for an SDR application.
25.	20EC E06	<b>PRINCIPLES AND APPLICATIONS OF AI</b>	Understand the basics of AI and intelligent agents.
			Apply Expert Systems to solve real time problems
			Understand knowledge representation methods.
			Build algorithms using neural network techniques for various applications
			Solve the various classification problems like object recognition
26.	20EC E07	<b>CMOS Analog IC Design</b>	Recall the elementary concepts of MOS device, MOS amplifiers, Current Mirrors, frequency response and noise.
			Classify different types of MOS devices, MOS amplifiers and current mirrors.
			Analyze (analytically) a given amplifier circuit for extracting parameters like gain, impedance, bandwidth, noise, etc.
			Design an amplifier or it's subcomponent as per the given specification.
			Justify with sufficient trade-off the use of an appropriate amplifier or subcomponent for a given specification.
27.	20EC E08	<b>Mobile Cellular Communication</b>	Relate the cellular concepts like frequency reuse, hand off, coverage and capacity.
			Analyse the mobile radio propagation with large scale and small scale fading.
			Select the suitable diversity technique to combat the multipath fading effects.
			Compare the mobile radio standards.
			Examine the advance wireless standards.



28.	20EC E09	<b>BIOMEDICAL SIGNAL PROCESSING</b>	Describe the physiological, physical, and chemical background of the most common bioelectrical phenomena.
			Implement signal processing techniques on biomedical signals.
			Adapt various detection techniques to identify ECG parameters
			Assess various Signal Processing techniques for analysis of EEG
			Understand the signal processing steps involved in Brain-Computer Interface.
29.	20EC E10	<b>SENSORS AND ACTUATORS</b>	Understand the fundamental and applications of several different types of sensors and actuators.
			Evaluate and perform accurate measurements for any engineering system with clear idea of the potential errors.
			Understand the working principles of various transducers.
			Select an appropriate transducer for given application.
			How to develop a sensor and actuator systems for practical applications.
30.	20EC E11	<b>DRONES AND APPLICATIONS</b>	Apply the concept of Flight dynamics for building Drone
			Assemble and Program the Drone
			Perform Testing and Control operations on the Drone
			Apply control mechanism to track and control Parallax ELEV-8 Quadcopter Build.
			Use of Drone for real-world applications
31.	20EC E12	<b>FUNDAMENTALS OF CLOUD COMPUTING</b>	Understand the basic concepts of cloud computing.
			Describe the characteristics, advantages, risks and challenges associated with cloud computing.
			Explain and characterize various cloud service models, cloud deployment models.
			Investigate/Interpret the security and privacy issues related to cloud computing environments.
			Apply the concepts of cloud computing in real world scenario.
32.	20EC C19	<b>DIGITAL COMMUNICATION LAB</b>	Demonstrate various pulse digital modulation techniques.
			Assess different line coding techniques.
			Detect and correct errors in cyclic codes.
			Examine the errors in convolutional encoder and decoder.
			Evaluate various digital carrier modulation techniques experimentally.

33.	20EC C20	DIGITAL SIGNAL PROCESSING LAB	Illustrate linear convolution and correlation using MATLAB.
			Design the digital filters using MATLAB.
			Examine the performance of multirate techniques using MATLAB.
			Experiment with decimator and interpolator on DSP processor.
			Implement the digital filters on DSP processor.
34.	20EC C21	LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB	Analyze the configurations, parameters of Op-Amp (IC741).
			Demonstrate the circuits of Op-Amp for various applications.
			Design the circuits using IC555 timer, IC723 and data converters.
			Determine the characteristics of TTL and CMOS gates
			Develop various combinational circuits and sequential circuits using digital ICs.
35.	20EC I02	INDUSTRIAL INTERNSHIP/ RURAL INTERNSHIP	Understand Engineer's responsibilities and ethics
			Use various materials, processes, products and quality control
			Provide innovative solutions to solve real world problems
			Acquire knowledge in technical reports writing and presentation
			Apply technical knowledge to real world industrial/rural situations
36.	20EC C22	MICROCONTROLLERS	Understand the architectures of different microcontrollers to enable to design of applications using them.
			Develop code both in assembly and in high level language for various applications of microcontrollers.
			Analyze and develop applications by using on-chip peripherals of different microcontrollers.
			Interface various I/O Modules with 8051 microcontrollers.
			Apply theoretical learning to practical real time problems for automation
37.	20EC C23	VLSI DESIGN	Model a digital design using Advanced Verilog HDL constructs.
			Analyse the characteristic behavior of MOSFET and discuss CMOS circuit Design Process
			Explain various process steps involved in IC fabrication.
			Design various NMOS and CMOS based logic circuits.
			Discuss the concepts of subsystem designs and Testing.
38.	20EC E13	CPLD AND FPGA ARCHITECTURES	Explain the concepts of PLDs, CPLDs and FPGAs.
			Analyze and compare the various architectures of

			<p>CPLD and FPGA and its programming technologies.</p> <p>Implement various logic functions on PLDs, CPLDs and FPGAs.</p> <p>Understand the concepts of placement and routing and classifying ASICs.</p> <p>Demonstrate VLSI tool flow for CPLDs and FPGAs.</p>
39.	20EC E14	<b>CODING THEORY AND TECHNIQUES</b>	<p>Recall the theory and principles of information theory and channel Coding.</p> <p>Design and analyze the encoding and decoding circuits for various coding techniques.</p> <p>Apply the principles of abstract algebra, finite fields and its extension to design related codes.</p> <p>Examine the error detection and correction capability of coding techniques for digital communication.</p> <p>Evaluate the performance of error control codes using different decoding algorithms.</p>
40.	20EC E15	<b>MULTIRATE AND WAVELET SIGNAL PROCESSING</b>	<p>Interpret the basics concepts of multirate digital signal processing.</p> <p>Implement the multirate filter bank structures.</p> <p>Explore the MRA and classes of wavelets.</p> <p>Understand the basic concepts of the continuous and discrete wavelet transform.</p> <p>Explain the special topics such as wavelet packets and Biorthogonal wavelets.</p>
41.	20EC E16	<b>REAL TIME OPERATING SYSTEMS</b>	<p>Understand Real-time operating system requirements and applications.</p> <p>Categorize different scheduling approaches for real time scheduler.</p> <p>Differentiate various RTOS features and POSIX standards</p> <p>Analyze the inter task communication in RTOS.</p> <p>Apply the Linux based embedded system design process.</p>
42.	20EC E17	<b>Green Communication</b>	<p>Understand the challenges in energy efficiency and spectral efficiency for digital data transmission.</p> <p>Conceptualize significant energy efficiency trade off in green wireless networks. Apply the basics of Python programming language, which is used in many IoT devices.</p> <p>Apply the methods to manage the dynamic loads of mobile communications for energy saving.</p> <p>Indicate the design practices for power minimization at cellular base station.</p> <p>Implement cell deployment strategies for efficient network management.</p>
43.	20EC E18	<b>CRYPTOGRAPHY AND BLOCKCHAIN TECHNOLOGY</b>	<p>Comprehend the key concepts of fundamental cryptography techniques which are required for Blockchain Technology.</p> <p>Describe the key concepts and compare various models of Blockchain Technology.</p> <p>Understand consensus mechanism in Blockchain.</p> <p>Acquire knowledge regarding cryptocurrency transactions and their validation.</p>

			Apply the concepts of Blockchain technology in real world scenario.
44.	20EC E19	<b>DESIGN FOR TESTABILITY</b>	Understand the concepts of testing for VLSI circuits.
			Apply techniques to improve testability of VLSI circuits.
			Utilize logic simulation methods such as ATPG in testing of VLSI circuits.
			Analyze the concepts of BIST in testing of VLSI circuits.
			Evaluate various Testing methods
45.	20EC E20	<b>SATELLITE COMMUNICATION</b>	Demonstrate the fundamental concepts of Orbital Aspects and Orbital Mechanics
			Identify the mechanisms for placing satellites and examine the orbital effects on satellites, launch mechanisms.
			Compare the Multiple access techniques for satellite communications and demonstrate the satellite subsystems.
			Design an appropriate satellite communication link for the given specifications
			Inspect the working principle and related aspects of DBSTV and VSAT.
46.	20EC E21	<b>IMAGE AND VIDEO PROCESSING</b>	To Learn image representation.
			Apply Image enhancement and segmentation techniques both in spatial and frequency domain.
			To reduce the redundancy in both lossy and lossless compression models.
			Apply 2D-Motion estimation algorithms and develop predictive coding.
			Creatively apply contemporary theories, processes and tools in the development and evolution of solutions to problems related to image and video processing.
47.	20EC E22	<b>EMBEDDED SYSTEMS</b>	Understand the fundamentals of the embedded systems.
			Analyze the hardware and software details of the embedded systems.
			Design interfacing of the systems with other data handling / processing systems.
			Evaluate the performance of an embedded system using various debugging tools.
			Apply the embedded design approach for various applications.
48.	20EC E23	<b>SMART ANTENNAS</b>	Understand the basic principles of Non Uniform and Planar antenna arrays.
			Comprehend the necessity of smart antenna and smart antenna configuration.
			Understand the DOA estimation methods and compare different algorithms for DOA estimation
			Analyze various beamforming algorithms used in a smart antenna system
			Describe the fundamentals of the MIMO and RDA antenna systems.
49.	20EC E24	<b>DATA ANALYTICS FOR SIGNAL PROCESSING</b>	Explain data science fundamentals
			Explore the principles of probability and statistical theory

			Understand various machine learning algorithms using applied statistics
			Analyze supervised and unsupervised learning models with regression and classification techniques
			Construct various applications of image and speech processing using MATLAB/Python
50.	20EC E25	20EC E25 CMOS Data Converters	Understand Op-Amp based designs
			Explain various performance measures of Data converters
			Design and analyze mixed mode circuits such as Comparator, switched capacitor and sample & hold circuits
			Design and analyze an A/D or D/A converter circuits.
			Explain principles of oversampling
51.	20EC E26	5G COMMUNICATIONS	Recall the requirements and key functionalities of 4G LTEA/5G NR technology.
			Compare various channel access technologies, modulation techniques used in 5G wireless systems.
			Illustrate the architecture of 5G and its NextGen core network.
			Apply the 5G concepts to D2D communications.
			Demonstrate the concept of massive MIMO.
52.	20EC E27	DSP PROCESSORS AND ARCHITECTURES	Classify the differences between DSP Processor and General-Purpose processor.
			Understand the basic architectural needs of Programmable DSPs
			Explain the architecture features of TMS320C55XX processor.
			Develop on interface with TMS320C55XX processor to external peripherals.
			Design and implement of various signal processing algorithms using 55xx processor.
53.	20EC E28	ADVANCED MICROPROCESSORS AND APPLICATIONS	Understand the historic evaluation of 80286,386,486
			Explain the basic and advance Pentium features & architecture.
			Analyze the Memory Management mechanisms employed in advanced Microprocessors.
			Understand the concepts related to SoC Design
			Demonstrate and design a microprocessor based applications.
54.	20EC E29	PRINCIPLES OF GNSS	Demonstrate the fundamental concepts of communications in understanding of GPS architecture, operation and signal structure.
			Apply the principles of orbital mechanics, time references, coordinate systems and range

			measurements in estimating user position.
			Examine the effect of various error sources and satellite geometry on position estimates and analyze the suitability of a given data format.
			Compare the architecture and working of other GNSS systems and make use of GNSS systems in a variety of civilian and defense applications.
			Relate the knowledge of DGPS techniques in understanding augmentation systems.
55.	20EC E30	<b>PATTERN RECOGNITION USING MACHINE LEARNING</b>	Understand the concepts of pattern recognition.
			Apply the parametric and linear models for classification.
			Design algorithms using neural networks for machine learning problems.
			Implementation of Support Vector Machines (SVM) algorithm for real time applications.
			Evaluate various unsupervised clustering techniques.
56.	20ECC24	<b>ELECTRONIC DESIGN AND AUTOMATION LAB</b>	Demonstrate the process steps required for simulation /synthesis
			Develop HDL codes/scripts with appropriate syntax
			Apply an appropriate modelling style to describe various combinational and sequential circuits in Verilog HDL
			Examine the successful execution of the codes/ schematic using various Simulation Tools
			Build various digital circuits on hardware boards like FPGA.
57.	20ECC25	<b>MICROCONTROLLERS LAB</b>	Develop the programs of 8051 and ARM using their respective instruction set.
			Understand the usage of various debugging tools available to program different microcontrollers
			Build code for 8051 and ARM7 to interface various input/output modules
			Analyze the hardware and software interaction and integration.
			Design and develop the 8051 and ARM 7 based embedded systems for various applications
58.	20ECC26	<b>MINI PROJECT</b>	Formulate mini project proposal through literature survey.
			Plan, design and analyze the proposed mini project.
			To simulate and execute the mini project for validation.
			Enhance oral presentation skills.
			Prepare and submit the mini project report.



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# Course outcomes statements for BE (ECE) - R22

## I Year

S.No	Subject code	Name of subject	Course Outcomes Statements
1	22MTC01	CALCULUS	Determine the extreme values of functions of two variables.
			Apply the vector differential operator to scalar and vector functions
			Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems
			Determine the basis and dimension of a vector space, compute linear transformation.
			Apply the Matrix Methods to solve the system of linear equations
2	22CYC01	CHEMISTRY	Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
			Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
			Illustrate the major chemical reactions that are used in the synthesis of organic molecules
			Classify the various methods used in treatment of water for domestic and industrial use.
			Outline the synthesis of various Engineering materials & Drugs.
3	22EEC01	BASIC ELECTRICAL ENGINEERING	Understand the concepts of Kirchhoff's laws and their application various theorems to get solution of simple dc circuits.
			Predict the steady state response of RLC circuits with AC single phase/three phase supply.
			Infer the basics of single phase transformer
			Describe the construction, working principle of DC machine and 3-phase Induction motor.
			Acquire the knowledge of electrical wires, cables, earthing, Electrical safety precautions to be followed in electrical installations and electric shock and its safety and energy calculations.
4	22CSC01	PROBLEM SOLVING AND PROGRAMMING	Understand real world problems and develop computer solutions for those problems.
			Understand the basics of Python.
			Apply Python for solving basic programming solutions.
			Create algorithms / flow charts for solving real-time problems
			Build and manage dictionaries to manage data.
5	22CSC02	PROBLEM SOLVING AND PROGRAMMING LAB	Handle data using files.
			Understand various Python program development Environments.
			Demonstrate the concepts of Python.
			Implement algorithms/flowcharts using Python to solve real-world problems.
			Build and manage dictionaries to manage data.
Write Python functions to facilitate code reuse.			
			Use Python to handle files and memory.

  
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6	22CYC02	CHEMISTRY LAB	Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
			Estimate the amount of chemical substances by volumetric analysis
			Determine the rate constants of reactions from concentration of reactants / products as a function of time.
			Calculate the concentration and amount of various substances using instrumental techniques.
7	22MBC02	COMMUNITY ENGAGEMENT	Develop the basic drug molecules and polymeric compounds
			Gain an understanding of Rural life, Culture and Social realities.
			Develop a sense of empathy and bonds of mutuality with Local Communities
			Appreciate significant contributions of Local communities to Indian Society and Economy.
			Exhibit the knowledge of Rural Institutions and contributing to Community's Socio Economic improvements.
8	22MEC37	ROBOTICS AND DRONES LAB	Utilise the opportunities provided by Rural Development Programmes.
			Demonstrate knowledge of the relationship between mechanical structures of robotics and their operational workspace characteristics
			Understand mechanical components, motors, sensors and electronic circuits of robots and build robots.
			Demonstrate knowledge of robot controllers.
			Use Linux environment for robotic programming.
9	22EEC02	BASIC ELECTRICAL ENGINEERING LAB	Write Python scripts to control robots using Python and Open CV.
			Comprehend the circuit analysis techniques using various circuit laws and theorems.
			Analyse the parameters of the given coil and measurement of power and energy in AC circuits
			Determine the turns ratio/performance parameters of single-phase transformer
			Infer the characteristics of DC shunt motor different tests.
10	22MTC05	VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS	Illustrate different parts and their function of electrical components, equipment and machines.
			Apply the vector differential operators to Scalars and Vector functions.
			Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
			Calculate the solutions of first order linear differential equations.
			Solve higher order linear differential equations.
11	22PYC01	OPTICS AND SEMICONDUCTOR PHYSICS	Find solution of algebraic, transcendental and ODE by Numerical Methods.
			Demonstrate the physical properties of light.
			Explain characteristic properties of lasers and fiber optics
			Find the applications of quantum mechanics
			Classify the solids depending upon electrical conductivity
			Identify different types of semiconductors.



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12	22CEC01	ENGINEERING MECHANICS	Calculate the components and resultant of coplanar forces system and Draw free body diagrams to analyze the forces in the given structure
			Understand the mechanism of friction and can solve friction problems
			Analyse simple trusses for forces in various members of a truss.
			Determine the centroid of plane areas, composite areas and centres of gravity of bodies.
			Determine moments of inertia, product of inertia of plane and composite areas and mass moments of inertia of elementary bodies,
13	22EGC01	ENGLISH	Illustrate the nature, process and types of communication and communicate effectively without barriers.
			Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
			Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
			Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
			Critique passages by applying effective reading techniques.
14	22PYC09	ELECTROMAGNETIC THEORY AND QUANTUM MECHANICS LAB	Experiment with the concept of errors and find the ways to minimize the errors
			Demonstrate properties of light experimentally
			Find the applications of lasers and optical fibers in engineering applications
			Make use of semiconductor devices for practical applications
			Illustrate the working of optoelectronic devices
15	22EGC02	ENGLISH LAB	Define the speech sounds in English and understand the nuances of pronunciation in English.
			Apply stress correctly and speak with the proper tone, intonation and rhythm.
			Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.
			Determine the context and speak appropriately in various situations.
			Design and present effective posters while working in teams, and discuss and participate in Group discussions
16	22MEC01	CAD AND DRAFTING	Become conversant with appropriate use of CAD software for drafting.
			Recognize BIS, ISO Standards and conventions in Engineering Drafting.
			Construct the projections of points, lines, planes, solids
			Analyse the internal details of solids through sectional views
			Create an isometric projections and views
17	22MEC38	DIGITAL FABRICATION LAB	Understand safety measures to be followed in workshop to avoid accidents.
			Identify various tools used in carpentry, house wiring and plumbing.
			Make a given model by using workshop trades like carpentry, plumbing, House wiring and 3d modeling using solid works software for Additive Manufacturing.
			Perform pre-processing operations on STL files for 3D printing, also understand reverse engineering process.
			Conceptualize and produce simple device/mechanism of their choice.