



Lokmanya Tilak Jankalyan Shikshan Sanstha's  
**PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING**  
Harpur Nagar, Umred Road (Near Bada Tajbagh), Nagpur-24  
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Department of Electronics & Communication Engineering  
Academic Session 2022-23  
**Course Outcomes**

S.N.	Semester	Course	Course Code	CO No.	Course Outcome Statement
1	III	Applied Mathematics - III	BEEC-301T	CO1	Apply Laplace transform to solve ordinary differential equations, Integral equations and integro-differential equation.
				CO2	Evaluate Fourier series in the analysis of periodic functions in terms sine and cosine and Fourier transform to solve integral equations.
				CO3	Analyze analytic functions in complex numbers.
				CO4	Evaluate partial differential equations of first-order, higher order with constant coefficients and of second order using method of separation of variables.
				CO5	Analyze real world scenario to recognize when matrices are appropriate, formulate problems.
2	III	Components for Electronic Circuit Design	BEEC-302T	CO1	Analyse the behaviour of charge carriers in semiconductors using quantum mechanics, energy band theory and carrier transport mechanisms.
				CO2	Explain the operation and characteristics of diodes and their applications in electronic circuits.
				CO3	Analyse the characteristics and applications of BJT with appropriate biasing techniques.
				CO4	Describe the construction and characteristics of UJT, JFET and MOSFET for low frequency applications.
				CO5	Explain the steps in integrated circuit fabrication and parameters involved in CMOS-based resistor design.
3	III	Components for Electronic Circuit Design Lab	BEEC-302P	CO1	Identify electronic instruments and components such as CRO, DSO, multimeter, resistors, capacitors, diodes and transistors used in circuit configurations.
				CO2	Design basic electronic circuits including rectifiers, regulators, amplifiers, and oscillators using semiconductor devices.
				CO3	Construct electronic circuits using appropriate instruments and components to meet desired specifications.
				CO4	Analyze electrical parameters such as voltage, current, ripple, and frequency response, and compare them with theoretical values.
				CO5	Demonstrate professional skills including teamwork, documentation and adherence to ethical and safety standards in a lab environment.

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4	III	Digital System Design	BEEC-303T	CO1	Explain number systems, Boolean algebra, logic gates, and K-map techniques for logic minimization.
				CO2	Analyze combinational circuits including adders, ALUs, multiplexers, demultiplexers and encoders.
				CO3	Illustrate the knowledge of different flip-flops to build sequential logic circuits.
				CO4	Design different types of counters.
				CO5	Explain the fundamentals of the 8085 microprocessor.
5	III	Digital System Design Lab	BEEC-303P	CO1	Simplify and implement Boolean expressions using logic gates.
				CO2	Design and verify combinational circuits like adders and comparators.
				CO3	Implement MUX/DEMUX and use MUX for logic functions.
				CO4	Analyze flip-flops and design counters.
				CO5	Write and execute 8085 programs for basic operations.
6	III	Network Theory	BEEC-304T	CO1	Apply mesh and node voltage methods for electrical circuit analysis.
				CO2	Apply network theorems for the analysis of networks.
				CO3	Determine the transient and steady-state responses of electrical circuits.
				CO4	Analyze electrical networks using waveform synthesis and Laplace transforms.
				CO5	Evaluate network functions and two-port network behaviour.
7	III	Signals & Systems	BEEC-305T	CO1	Classify different types of signals and systems.
				CO2	Illustrate the concept of Linear Time Invariant (LTI) system and its properties.
				CO3	Analyze continuous time periodic and aperiodic signals.
				CO4	Analyze continuous time systems using Laplace Transform.
				CO5	Analyze DT signals and systems in frequency domain using Fourier Transform.
8	III	Measurements and Instrumentation	BEEC-306T	CO1	Select and apply appropriate instruments to measure electrical parameters .
				CO2	<b>Classify</b> measurement bridges and analyze methods to minimize errors in electrical and electronic measurements.
				CO3	Apply calibration techniques for Digital Storage Oscilloscope (DSO) and measure analog and digital signals.
				CO4	<b>Apply</b> measurement techniques to <b>calibrate and measure</b> power and frequency using function generators and analyzers.
				CO5	<b>Analyze</b> modern trends in telemetry systems.
9	III	Electronics Workshop I Lab	BEEC-307P	CO1	Identify and analyse the characteristics of basic passive components (resistors, capacitors , inductors ) by testing their values and parameters and categorize their suitable applications in electronic circuits.
				CO2	Examine and interpret the characteristics of semiconductor devices such as diodes, transistors, photo diodes, opto couplers and summarize their operating principles and practical uses.
				CO3	Demonstrate the working and performance of energy-conversion devices, including solar cells and DC motors and categorize their applications based on their electrical characteristics.
				CO4	Analyze the classify different types of sensors and electromechanical actuators, such as stepper motors and induction motors, based on their working principles and application domains.

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				CO5	Design, simulate and develop basic electronic circuits using PCB design tools and implement a mini-project by integrating active and passive components following standard engineering procedures.
10	IV	Microcontroller and Applications	BEEC-401T	CO1	Demonstrate the programming model of various microcontrollers
				CO2	Design and implement 8051 microcontroller-based systems for various applications.
				CO3	Illustrate & program AVR/RISC microcontrollers in Integrated Development Environment.
				CO4	Design and implement advanced processor/controllers-based systems for various applications.
				CO5	Design and develop Arduino based embedded system applications.
11	IV	Microcontrollers and Applications Lab	BEEC-401P	CO1	Demonstrate the concept of Assembly languages and higher level language programming.
				CO2	Interface various peripherals with 8051, Atmega 32, MSP 430 and Arduino.
				CO3	Simulate the programs on different software platforms.
				CO4	Apply timer and interrupt concepts of the 8051 microcontroller for real-time applications such as LED interfacing and control.
				CO5	Design and implement programs for embedded systems.
12	IV	Analog and Digital Communication	BEEC-402T	CO1	Analyse amplitude and angle modulation techniques using mathematical models and performance parameters.
				CO2	Evaluate AM and FM demodulation techniques and radio receiver performance characteristics.
				CO3	Apply sampling and pulse analog modulation techniques, including PCM and its variants.
				CO4	Explain digital modulation methods and concepts of information theory and source coding.
				CO5	Apply error control coding and spread spectrum techniques in communication systems.
13	IV	Analog and Digital Electronics Lab	BEEC-403P	CO1	Explain the practical aspects of linear and non-linear applications of OP-AMP.
				CO2	Design various wave-shaping circuits, oscillators, signal conditioners and various applications based circuits using OP-AMP and Transistors.
				CO3	Demonstrate various concepts of analog communication.
				CO4	Explain various concepts of digital communication.
				CO5	Develop an application based project using industry based OP-AMP.
14	IV	Analog System Design	BEEC-404T	CO1	Explain the operation of a basic transistor differential amplifier and the fundamental concepts of operational amplifier..
				CO2	Design operational amplifier circuits for various linear applications.
				CO3	Implement operational amplifier circuits for various non-linear applications.
				CO4	Develop DC power supply circuits for electronic applications.
				CO5	Design various types of sinusoidal oscillators and filters.
15	IV	Data Structures and Algorithm	BEEC-405T	CO1	<b>Explain and analyze</b> basic data structures such as arrays, linked lists, stacks, and queues, and <b>analyze</b> algorithm complexity using asymptotic notations.
				CO2	<b>Apply</b> data structure concepts to solve problems involving sorting, searching, insertion, and deletion operations.

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				CO3	<b>Apply and implement</b> linear data structures such as stacks, queues, and linked lists to solve computational problems.
				CO4	<b>Analyze and implement</b> non-linear data structures such as trees and graphs to solve complex problems.
				CO5	<b>Design</b> algorithms using appropriate data structures and techniques for efficient problem solving.
16	IV	Numerical Mathematics & Probability using MATLAB	BEEC-406T	CO1	Utilize MATLAB as a simulation tool for various engineering applications.
				CO2	Compute approximate solutions of algebraic and transcendental equations using numerical methods and MATLAB commands.
				CO3	Solve first-order ordinary differential equations using numerical methods and MATLAB commands.
				CO4	Apply Z-transform techniques to solve linear difference equations with constant coefficients using MATLAB.
				CO5	Analyze probability distributions and calculate their statistical constants.
17	IV	Programming for Problem Solving	BEEC-407T	CO1	<b>Apply</b> Java programming concepts using conditional statements and loops to solve basic problems.
				CO2	<b>Explain and implement</b> Java methods and constructors in program development.
				CO3	<b>Analyze and implement</b> object-oriented concepts such as method overloading, overriding, and inheritance in Java programs.
				CO4	<b>Explain and analyze</b> Java programs using interfaces and packages.
				CO5	<b>Apply and analyze</b> exception handling techniques to detect and handle errors in Java programs.
18	IV	Programming for Problem Solving Lab	BEEC-407P	CO1	Elaborate the concept of OOPS and write java code implement basic programs.
				CO2	Summarize the concept of methods and constructors and develop java code to implement constructors.
				CO3	Elaborate the concept of method overloading and overriding and develop java code to implement overriding functionality.
				CO4	Discuss the concept of abstract class and implement the abstraction process using program.
				CO5	Summarize the concept of exceptions, types and uses. Develop a code to recognize multiple errors.
19	IV	Internship	BEEC-808I	CO1	<b>Apply</b> engineering knowledge to perform assigned tasks in an industrial or organizational environment.
				CO2	<b>Analyze</b> real-world problems encountered during the internship and identify appropriate solutions.
				CO3	<b>Explain</b> solutions or improvements for tasks or systems based on internship experience.
				CO4	<b>Evaluate</b> the performance of implemented solutions or processes in the workplace.
				CO5	<b>Demonstrate</b> professional and ethical behavior, teamwork, and communication skills in the internship environment.
20	IV	Universal Human Values	BEEC-409A	CO1	<b>Explain</b> self-awareness and awareness of surroundings including family, society, and nature.
				CO2	<b>Apply</b> human values to act responsibly and address life problems with sustainable solutions while maintaining relationships and harmony.
				CO3	<b>Analyze</b> values in human relationships and their impact on harmony.
				CO4	<b>Explain and analyze</b> the role of human beings in ensuring harmony in society and nature.
				CO5	<b>Evaluate</b> ethical and unethical practices in the workplace and <b>justify</b> actions that promote a value-based

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					society.
21	V	Embedded System Design	BEETC-501T	CO1	Explore the requirements & Design issues of embedded systems, also recognize the challenges while designing of embedded system.
				CO2	Explain the technical aspects of embedded system in terms of architecture, operating modes and interrupt structure for development of system.
				CO3	Interface with multiple resources like LED, buzzer, 7-segment display etc. with ARM Processor.
				CO4	Elaborate the concept of Real Time Operating System and kernel architecture in embedded system.
				CO5	Explore knowledge of the Real-Time Operating System in terms of Resource Management, semaphore, Mailbox, Message queues, Pipes and Events.
22	V	Embedded System Design Lab	BEETC-501P	CO1	Discuss the architecture, interfacing features, and operation of ARM LPC2148 development board.
				CO2	Interface single LEDs and Multiple LEDs with ARM LPC2148 and implement LED blinking concept.
				CO3	Interface electronics components like buzzer with ARM PLC 2148 and program to ON and OFF buzzer with suitable delay.
				CO4	Demonstrate interfacing of 16*2 LCD with ARM LPC 2148 and program to display string.
				CO5	Implement interfacing of servo and DC motor with ARM LPC2148 and program to rotate motor.
23	V	Electromagnetic Waves	BEETC-502T	CO1	Analyse vector calculus concepts and electrostatic laws using appropriate systems.
				CO2	Apply magnetic field laws and Maxwell's equations to electromagnetic field problems.
				CO3	Derive electromagnetic wave equations and related propagation phenomena in different media.
				CO4	Explain waveguide fundamentals and field equations for TE and TM modes in rectangular waveguides.
				CO5	Evaluate radiation fields and antenna parameters for various antenna types and configurations.
24	V	Digital Signal Processing	BEETC-503T	CO1	Analyze signal operations of discrete-time signals and systems.
				CO2	Apply the discrete Fourier transform to analyse discrete-time signals and systems in the frequency domain.
				CO3	Evaluate discrete-time signals and systems in the Z-domain using the Z-transform and its properties.
				CO4	Analyze different realization structures (DFI,DFII, cascade and parallel) of discrete-time signals.
				CO5	Design IIR and FIR digital filters and determine parameters affecting their response.
25	V	Digital Signal Processing Lab	BEETC-503P	CO1	Demonstrate the sampling and reconstruction of discrete time signal & perform different signal operations in developing discrete time system.
				CO2	Analyze and process the signals in the discrete domain.
				CO3	Analyze different properties of the discrete time Fourier transform.
				CO4	Design the analog and digital filters to suit the requirements of specific applications.
				CO5	Apply the techniques, skills, and modern engineering tools like MATLAB.
26	V	Industrial Economics & Entrepreneurship Development	BEETC-504T	CO1	<b>Classify</b> different types of business structures based on their characteristics and functions.
				CO2	<b>Explain</b> different market structures and new economic policies.
				CO3	<b>Analyze</b> the functions of banks, taxation systems, and the impact of inflation on the economy.
				CO4	<b>Identify and explain</b> various sources of finance for business operations.

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				CO5	Analyze the problems of small-scale industries and evaluate government policies affecting them.
27	V	Sensors & Systems (E-I)	BEETC-505PE	CO1	Explain and analyze the fundamental physical and technical principles of sensors,
				CO2	Outline basic laws and phenomena defining the behaviour of sensors in automobile applications.
				CO3	Analyze and evaluate various approaches, procedures, and results related to sensors in automation industries.
				CO4	Design analytical development solutions for various sensors used in IoT smart city projects.
				CO5	Analyze the acquired data and measured results of various actuators and motors used in the robotics field.
28	V	Antenna and Wave Propagation (E-I)	BEETC-505PE	CO1	Explain the concepts of transmission line characteristics, transmission line equations, and standing wave ratio.
				CO2	Calculate and analyze antenna parameters and the performance of wire antennas such as monopoles, dipoles, and loops.
				CO3	Analyze and design array antennas such as broadside and end-fire arrays, and explain the operation of broadband and travelling wave antennas.
				CO4	Analyze and design microstrip and reflector antennas, and explain the operation of aperture and reflector antennas.
				CO5	Analyze antenna measurement parameters such as gain, directivity, radiation pattern, polarization, and explain wave propagation mechanisms including ionospheric, ground, and space wave propagation.
29	V	Electronic Workshop-II Lab	BEETC-506P	CO1	Analyze different PCB design software.
				CO2	Implement and develop mini project using PCB layout software.
				CO3	Develop and simulate different programs on electronics based software.
				CO4	Demonstrate and design Arduino based projects.
				CO5	Demonstrate and design Raspberry-Pi based projects.
30	VI	Computer Communication Networks	BEETC-601T	CO1	Describe the basics of Computer Network, Data Communication, Network topologies, transmission media and switching techniques.
				CO2	Analyse the services and features of various protocols of Data Link Layer and MAC sub-layer.
				CO3	Apply the concept of IP addressing techniques and its various protocols of Network Layer.
				CO4	Describe the transport layer, Application Layer services and its protocol Headers and analyse the congestion control protocols.
				CO5	Explain the function of Application Layer and Presentation layer paradigm and protocols.
31	VI	Computer Communication Networks Lab	BEETC-601P	CO1	Select various cables and connectors used for networking with consideration for computer network security.
				CO2	Validate implementation results on software like NS2 and simulate different networking models and implement different networking protocols.
				CO3	Model different networking scenarios and implement various networking protocols through simulation.
				CO4	Demonstrate different data transmission techniques using the TCP Protocol and evaluate IP addressing for various systems.
				CO5	Illustrate different data transmission techniques using the UDP Protocol and evaluate IP addressing for

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					various systems.
32	VI	Internet of Things	BEETC-602T	CO1	Analyze different design levels of IoT.
				CO2	Analyze IOT Architecture.
				CO3	Explain network and communication aspects.
				CO4	Design a portable IoT using Raspberry-Pi and Arduino.
				CO5	Analyze applications of IoT in real world scenarios.
33	VI	IoT Lab	BEETC-602P	CO1	Identify various types of Arduino and install Arduino IDE.
				CO2	Develop programs to monitor temperature and humidity using sensors with Arduino.
				CO3	Control output devices (LED, buzzer, motor) through programming on Arduino or Raspberry Pi.
				CO4	Implement wireless communication protocols like MQTT, Zigbee, and Bluetooth using Arduino or Raspberry Pi.
				CO5	Design and generate APIs to access sensor data via Node MCU.
34	VI	Wireless Sensor Networks	BEETC-603T	CO1	Summarize Commercial and Scientific Applications of Wireless Sensor Networks, Basic Wireless Sensor Technology
				CO2	Analyze Physical layer and Medium Access Control Protocols.
				CO3	Outline Transport Control Protocols for Wireless Sensor Networks.
				CO4	Explain Middleware, its protocols and Network Management for Wireless Sensor Networks.
				CO5	Illustrate Operating Systems and Hardware for Wireless Sensor Networks.
35	VI	Wireless Sensor Networks Lab	BEETC-603P	CO1	Learn Network Simulator-II installation for wireless sensor network.
				CO2	Analyze different protocol of WSN.
				CO3	Develop and simulate different programs of WSN on NS-II
				CO4	Learn various wireless network simulators.
				CO5	Select and justify the appropriate simulation tool for specific WSN scenarios based on comparative features.
36	VI	Computer Architecture (E-II)	BEETC-604PE	CO1	Explain the basics of Computer Organization, concepts of program as sequences and operation of computers.
				CO2	Design arithmetic logic unit for number operations.
				CO3	Describe organization of hierarchical memory.
				CO4	Analyze DMA operation, compare storage devices, and evaluate interrupt-driven I/O mechanisms.
				CO5	Explain the basic processing unit and Pipelining.
37	VI	Control System Engineering (E-II)	BEETC-604PE	CO1	Analyze the effect of feedback on system parameters and derive transfer functions for electrical and mechanical control systems.
				CO2	Analyze transfer functions using block diagram reduction and signal flow graph methods.
				CO3	Evaluate the time response of first and second-order systems and identify types of controllers.
				CO4	Determine system stability using various techniques and sketch root locus to locate closed-loop poles.

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				CO5	<i>Interpret</i> state space models and relate them to transfer functions.
38	VI	Environmental Engineering (Open Elective)	BECVE-605T	CO1	<b>Explain and analyze</b> the components of the biosphere and the impact of human activities on the environment.
				CO2	<b>Explain and analyze</b> the sources, causes, and impacts of pollutants on the global environment.
				CO3	<b>Apply</b> ethical principles and scientific knowledge to address issues related to waste generation and treatment.
				CO4	<b>Classify and analyze</b> different types and sources of waste and their management techniques.
				CO5	<b>Explain and analyze</b> noise pollution and its control methods.
39	VI	Effective Technical Communication	BEETC-606T	CO1	<b>Explain</b> the structure and usage of language in technical communication.
				CO2	<b>Apply</b> appropriate vocabulary and communication skills to perform effectively in interviews and enhance employability.
				CO3	<b>Apply</b> business writing skills to prepare professional documents.
				CO4	<b>Apply</b> technical and scientific writing skills in preparing structured reports and documents.
				CO5	<b>Apply</b> engineering knowledge to identify and define a real-world problem for the mini project.
40	VI	Mini Project (Internship)	BEETC-607I	CO1	<b>Analyze</b> the problem requirements and constraints for developing an appropriate solution.
				CO2	<b>Design</b> a suitable solution or system based on the identified problem.
				CO3	<b>Implement</b> the designed solution using appropriate tools and technologies.
				CO4	<b>Evaluate</b> the performance and effectiveness of the developed solution.
				CO5	<b>Explain and analyze</b> the components of the biosphere and the impact of human activities on the environment.
41	VII	DSP Processor & Architecture	BEECE701T	CO1	Explain the fundamentals of programmable DSPs and various DSP architectures.
				CO2	Explain the architecture, addressing modes, and instruction set of TMS320C5X DSP processor.
				CO3	Apply DSP instructions to develop simple programs for DSP processors.
				CO4	Explain the internal architecture and addressing modes of TMS320C54XX DSP processor.
				CO5	Apply advanced DSP processor concepts to implement algorithms using Code Composer Studio.
				CO6	Analyze the computational complexity of DFT and FFT algorithms and their application in filtering, interpolation, and decimation.
42	VII	DSP Processor & Architecture (Practical)	BEECE701P	CO1	Explain the architecture and features of DSP processors such as TMS320C54XX and Motorola DSP563XX.
				CO2	Apply DSP processor instructions to develop assembly language programs for arithmetic operations.
				CO3	Apply DSP tools such as Code Composer Studio and MATLAB to generate signals and implement DSP algorithms.
				CO4	Analyze the implementation of DSP algorithms such as FFT, interpolation, and decimation.
				CO5	Analyze the design and performance of FIR and IIR filters including finite word length effects using MATLAB and DSP processors.
43	VII	Television & Video Engineering	BEECE702T	CO1	Explain the fundamentals of television systems, composite video signals, and colour perception concepts.
				CO2	Explain different television standards such as NTSC, PAL, and SECAM and the working of TV transmitters and receivers.
				CO3	Explain the principles of digital television systems and digital video compression techniques such as MPEG standards.

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				CO4	Analyze the architecture and operation of HDTV systems, satellite TV, and modern television technologies.
				CO5	Analyze the working of video recording systems, IPTV, mobile TV, and video transmission techniques.
				VO6	Apply the concepts of television and video engineering to identify and use various consumer electronic devices and display systems.
44	VII	Television & Video Engineering (Practical)	BEECE702P	CO1	Explain the working of television receiver subsystems such as RF, IF, chroma, deflection, and power supply sections.
				CO2	Analyze composite video signals and different sections of TV systems using appropriate measurement techniques.
				CO3	Apply test instruments and pattern generators to observe and interpret television signal characteristics.
				CO4	Analyze faults in television systems and perform troubleshooting of different TV receiver sections.
				CO5	Explain modern television technologies such as HDTV and digital TV satellite systems and their practical applications.
45	VII	Optical Communication	BEECE703T	CO1	Explain the fundamental concepts and components of an Optical Fiber Communication system.
				CO2	Analyze the transmission characteristics of optical fibers and explain the fiber manufacturing processes.
				CO3	Describe and compare various optical sources, couplers, and connectors used in fiber communication systems.
				CO4	Explain and analyze the operating principles of different optical detectors and receiver circuits.
				CO5	Analyze the performance of analog and digital optical fiber communication links.
				CO6	Explain the concept of Wavelength Division Multiplexing (WDM) and discuss the applications of optical fibers and measurement techniques of fiber parameters.
46	VII	Advanced Digital System Design	BEECE704T	CO1	Explain the concepts of digital system design, levels of abstraction, and VHDL design flow.
				CO2	Apply VHDL language constructs to model combinational and sequential digital circuits.
				CO3	Apply VHDL subprograms, packages, and test benches for modular digital system design and verification.
				CO4	Analyze finite state machines and asynchronous sequential circuits using VHDL representation.
				CO5	Analyze synthesis techniques, timing constraints, and optimization methods for efficient digital system implementation.
				CO6	Evaluate the performance and architecture of programmable logic devices (FPGA/CPLD) for implementing digital systems.
47	VII	Advanced Digital System Design (Practical)	BEECE704P	CO1	Design and simulate basic combinational logic circuits such as logic gates, adders, multiplexers, encoders, and display drivers using VHDL.
				CO2	Develop sequential digital circuits such as counters and shift registers using VHDL.
				CO3	Model and analyze finite state machines (Mealy and Moore) for digital system applications.
				CO4	Design complex digital subsystems such as ALU, barrel shifter, and multiplier using hardware description language.
				CO5	Implement and verify digital system designs on FPGA/CPLD platforms using modern design tools.
48	VII	Elective 1 : VLSI Signal Processing	BEECE705T	CO1	Explain the concepts of pipelining and parallel processing techniques for VLSI signal processing systems.
				CO2	Apply retiming techniques to optimize digital signal processing architectures.
				CO3	Analyze unfolding techniques and their impact on system performance and critical path reduction.
				CO4	Analyze folding transformations and register minimization techniques in VLSI architectures.
				CO5	Apply fast convolution algorithms such as Cook-Toom and Winograd for efficient signal processing.
				CO6	Evaluate different convolution techniques for optimizing computational complexity in VLSI signal processing systems.
49	VII	Project Seminar	BEECE706P	CO1	Identify and study a relevant engineering problem or recent technological advancement through literature survey.
				CO2	Analyze technical information from research papers, journals, and industry sources to understand the problem domain.

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				CO3	Develop a structured seminar report and presentation using appropriate technical tools and documentation standards.
				CO4	Demonstrate effective oral presentation and communication skills while presenting technical content.
				CO5	Critically evaluate and discuss engineering solutions considering societal, environmental, and ethical aspects.
50	VIII	Microwave & Radar Engineering	BEECE801T	CO1	Explain the operating principles and characteristics of microwave tubes such as klystrons, magnetrons, and TWTs.
				CO2	Analyze microwave components using S-parameters and their applications in waveguide systems.
				CO3	Explain the working principles of solid-state microwave devices such as Gunn diode, IMPATT, and PIN diode.
				CO4	Apply microwave measurement techniques to determine parameters such as power, VSWR, and impedance.
				CO5	Analyze radar systems based on radar range equation and performance parameters.
				CO6	Explain different radar systems and techniques such as Doppler radar, phased array radar, and scanning methods.
				CO1	Explain the operating principles and characteristics of microwave devices such as klystron and Gunn diode.
51	VIII	Microwave & Radar Engineering (Practical)	BEECE801P	CO2	Apply microwave measurement techniques to determine parameters such as VSWR, insertion loss, coupling factor, and attenuation.
				CO3	Analyze the performance of microwave components such as Magic Tee, directional coupler, isolator, and circulator.
				CO4	Analyze antenna characteristics such as radiation pattern, gain, and beam width for different microwave antennas.
				CO5	Explain the working and applications of radar systems including pulse radar, FMCW radar, MTI radar, and tracking systems.
				CO1	Explain the fundamentals of computer networks, layered architecture, and reference models such as OSI and TCP/IP.
52	VIII	Computer Communication Network	BEECE802T	CO2	Analyze physical layer technologies, transmission media, and switching techniques used in computer networks.
				CO3	Analyze data link layer protocols, error control mechanisms, and network devices used for data communication.
				CO4	Analyze transport and network layer protocols, addressing schemes, and routing algorithms in computer networks.
				CO5	Apply application layer protocols and socket programming concepts for network communication.
				CO6	Evaluate network security mechanisms and network administration techniques for secure and efficient.
				CO1	Understand and use network simulation tools such as <b>NS2</b> for creating and analyzing different network topologies.
53	VIII	Computer Communication Network (Practical)	BEECE802P	CO2	Demonstrate data communication concepts using networking utilities and protocols such as Ping, Traceroute, IP configuration, TCP and UDP.
				CO3	Apply socket programming concepts to establish communication between networked systems.
				CO4	Configure and analyze networking components and services such as routers, DNS, DHCP, NAT, FTP and protocol analyzers.
				CO5	Apply fundamental concepts of network security and cryptography for secure communication in computer networks.
				CO1	Explain the concepts of cellular communication, frequency reuse, handoff strategies, and system capacity.
54	VIII	Wireless & Mobile Communication	BEECE803T	CO2	Analyze the mobile radio propagation environment including path loss, fading, and interference effects.
				CO3	Apply equalization, diversity techniques, and channel coding methods in wireless communication systems.
				CO4	Analyze GSM architecture, channel structure, and the fundamentals of CDMA and 3G wireless systems.
				CO5	Analyze wireless networking concepts including Mobile IP, routing, and wireless access protocols.
				CO6	Evaluate wireless LAN technologies and protocols such as IEEE 802.11 and WAP architecture for communication systems.
				CO1	Explain the fundamentals, design challenges, and applications of embedded systems along with current trends.
55	VIII	Elective II : Embedded System	BEECE804T	CO2	Analyze embedded system architecture including processor selection, memory organization, I/O interfacing, and

S.N.	Semester	Course	Course Code	CO No.	Course Outcome Statement
					interrupt handling mechanisms.
				CO3	Apply ARM processor architecture concepts and perform basic assembly language programming for embedded systems.
				CO4	Explain and analyze communication protocols such as Bluetooth, I2C, CAN, USB, and wireless standards used in embedded systems.
				CO5	Analyze real-time operating system concepts including scheduling, synchronization, inter-process communication, and memory management.
				CO6	Evaluate embedded system applications in domains such as communication, automation, security, and automotive systems.
56	VIII	Elective-III : Satellite Communication	BEECE805T	CO1	Explain the fundamentals of satellite communication including orbital mechanics and spacecraft subsystems.
				CO2	Apply satellite link design concepts to determine parameters such as noise temperature and carrier-to-noise ratio.
				CO3	Analyze multiple access techniques such as FDMA, TDMA, and CDMA used in satellite communication systems.
				CO4	Analyze the effects of propagation phenomena such as atmospheric absorption, rain attenuation, and multipath on satellite links.
				CO5	Analyze error detection and correction techniques used in satellite communication systems.
				CO6	Evaluate the design and performance of earth station components and satellite communication systems.
57	VIII	Project	BEECE806P	CO1	Identify, analyze and design engineering solutions to complex problems utilizing a systems approach.
				CO2	Demonstrate the knowledge, skills and attitudes of a professional engineer.
				CO3	Work in a team and communicate with peers & show correct attitude towards achieving the goals and objectives
				CO4	Address societal issues related to environment, sustainability, ethics and safety.
				CO5	Use modern tools in the field of Electronics and Communication Engineering.