Lokmanya Tilak Jankalyan Shikshan Sanstha's
PRIYADARSHINI BHAGWATI COLLEGE OF ENGINEERING
Harpur Nagar, Umred Road (Near Bada Tajbagh), Nagpur-24
(Approved by AICTE, New Delhi, Govt. of Maharashtra
and affiliated to Rashtrasant Tukdoji Maharaj Nagpur University)
Email: principalpbcoe@gmail.com, Website: www.pbcoe.edu.in
NAAC Accredited

Department of Electronics & Communication Engineering
Academic Session 2024-25
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

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					standards in a lab environment.
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 Invarient (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	Classify 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	Apply measurement techniques to calibrate and measure power and frequency using function generators and analyzers.
				CO5	Analyze 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

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					and induction motors, based on their working principles and application domains.
				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	Explain and analyze basic data structures such as arrays, linked lists, stacks, and queues, and analyze algorithm complexity using asymptotic notations.
				CO2	Apply data structure concepts to solve problems involving sorting, searching, insertion, and deletion operations.

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				CO3	Apply and implement linear data structures such as stacks, queues, and linked lists to solve computational problems.
				CO4	Analyze and implement non-linear data structures such as trees and graphs to solve complex problems.
				CO5	Design algorithms using appropriate data structures and techniques for efficient problem solving.
16	IV	Numerical Mathematics & Probability using MATLAB	BEEC-406T	CO1	Understand and use MATLAB effectively in various applications as a simulation tool.
				CO2	Apply numerical methods to solve algebraic and transcendental equations, systems of linear equations, and first-order ordinary differential equations using MATLAB commands.
				CO3	Apply MATLAB commands for Runge-Kutta method to solve simultaneous first order differential equations.
				CO4	Apply Z- transform to solve difference equations with constant coefficients
17	IV	Programming for Problem Solving	BEEC-407T	CO1	Apply Java programming concepts using conditional statements and loops to solve basic problems.
				CO2	Explain and implement Java methods and constructors in program development.
				CO3	Analyze and implement object-oriented concepts such as method overloading, overriding, and inheritance in Java programs.
				CO4	Explain and analyse Java programs using interfaces and packages.
				CO5	Apply and analyze 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	Apply engineering knowledge to perform assigned tasks in an industrial or organizational environment.
				CO2	Analyze real-world problems encountered during the internship and identify appropriate solutions.
				CO3	Explain solutions or improvements for tasks or systems based on internship experience.
				CO4	Evaluate the performance of implemented solutions or processes in the workplace.
				CO5	Demonstrate professional and ethical behavior, teamwork, and communication skills in the internship environment.
20	IV	Universal Human Values	BEEC-409A	CO1	Explain self-awareness and awareness of surroundings including family, society, and nature.
				CO2	Apply human values to act responsibly and address life problems with sustainable solutions while maintaining relationships and harmony.
				CO3	Analyze values in human relationships and their impact on harmony.
				CO4	Explain and analyze the role of human beings in ensuring harmony in society and nature.
				CO5	Evaluate ethical and unethical practices in the workplace and **justify** actions that promote a value-based society.
21	V	Embedded System	BEETC-	CO1	Explore the requirements & Design issues of embedded systems, also recognize the challenges while

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		Design	501T		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	Classify different types of business structures based on their characteristics and functions.
				CO2	Explain different market structures and new economic policies.
				CO3	Analyze the functions of banks, taxation systems, and the impact of inflation on the economy.
				CO4	Identify and explain various sources of finance for business operations.
				CO5	Analyze the problems of small-scale industries and evaluate government policies affecting them.
27	V	Sensors & Systems	BEETC-	CO1	Explain and analyze the fundamental physical and technical principles of sensors,

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		(E-I)	505PE	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	Electronic Design Technique with HDL (E-I)	BEETC-505PE	CO1	Summarize digital system design process with its basic element and different level of abstraction.
				CO2	Design digital systems through HDL language by using Behavioural Modelling Technique.
				CO3	Design digital systems through HD language by using Data flow and Structural Modelling Technique.
				CO4	Develop Finite State Machine and design VHDL representation.
				CO5	Describe Synthesis process for dataflow and structural models.
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 ink 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 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.

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				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 Arduiono.
				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.
				CO5	Interpret state space models and relate them to transfer functions.
38	VI	Environmental Engineering (Open Elective)	BECVE-605T	CO1	Explain and analyze the components of the biosphere and the impact of human activities on the environment.
				CO2	Explain and analyze the sources, causes, and impacts of pollutants on the global environment.
				CO3	Apply ethical principles and scientific knowledge to address issues related to waste generation and treatment.

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				CO4	Classify and analyze different types and sources of waste and their management techniques.
				CO5	Explain and analyze noise pollution and its control methods.
39	VI	Effective Technical Communication	BEETC-606T	CO1	Explain the structure and usage of language in technical communication.
				CO2	Apply appropriate vocabulary and communication skills to perform effectively in interviews and enhance employability.
				CO3	Apply business writing skills to prepare professional documents.
				CO4	Apply technical and scientific writing skills in preparing structured reports and documents.
40	VI	Mini Project (Internship)	BEETC-607I	CO1	Apply engineering knowledge to identify and define a real-world problem for the mini project.
				CO2	Analyze the problem requirements and constraints for developing an appropriate solution.
				CO3	Design a suitable solution or system based on the identified problem.
				CO4	Implement the designed solution using appropriate tools and technologies.
				CO5	Evaluate the performance and effectiveness of the developed solution.
41	VII	Audio & Video Engineering	BEETC-701PE-T	CO1	Explain the working of a TV receiver system including tuner, chroma, and power supply sections.
				CO2	Anayze composite color video signals and interprete various test patterns using a pattern generator.
				CO3	Measure and evaluate voltages at different test points in various sections of color TV receiver.
				CO4	Identity common faults in TV receivers and apply troubleshooting techniques for effective maintenance.
				CO5	Illustrate the architecture of advanced television systems such as HDTV and digital satellite TV.
42	VII	Audio & Video Engineering (Practical)	BEETC-701PE-P	CO1	Explain the working of a TV receiver system including tuner, chroma, and power supply sections.
				CO2	Analyze composite color video signals and interpret various test patterns using a pattern generator.
				CO3	Measure and evaluate voltages at different test points in various sections of a color TV receiver.
				CO4	Identify common faults in TV receivers and apply troubleshooting techniques for effective maintenance.
				CO5	Illustrate and discuss the architecture of advanced television systems such as HDTV and digital satellite TV.
43	VII	Data Science & Cloud Computing	BEETC-702PE-T	CO1	Describe the key concepts and terminology related to data science and the data science process.
				CO2	Apply data management techniques to explore, clean, and prepare data for analysis.
				CO3	Analyze data using statistical method with R.
				CO4	Interpret different types of statistical data analysis using Data Visualization.
				CO5	Apply data science techniques to real-world problems using Python.
44	VII	Data Science & Cloud Computing Lab	BEETC-702PE-P	CO1	Understand and apply fundamental Python programming concepts for data manipulation.
				CO2	Utilize the Numpy library for efficient array operations and numerical computations.
				CO3	Implement basic data manipulation and analysis tasks using Python and Numpy.
				CO4	Gain introductory knowledge of cloud computing concepts and platforms.
				CO5	Develop basic applications on a specific cloud platform (salesforce) using its proprietary tools.
45	VII	Biomedical Engineering	BEETC-703PE-T	CO1	Explain biomedical engineering principles and signal analysis techniques.
				CO2	Compare and analyze major medical imaging technologies.
				CO3	Evaluate the suitability and performance of biomedical sensors for specific applications.

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				CO4	Explain and apply the principles of medical instruments in various biomedical applications.
				CO5	Analyze and evaluate hospital systems, safety standards, and ethical issues in medical technology.
46	VII	Waste Management (Open Elective)	BEETC-704OE-T	CO1	Explain the sources, characteristics, and impacts of solid waste on human health and the environment.
				CO2	Analyze the challenges in handling, collection, transportation, and processing of solid waste and **design** safe waste management methods.
				CO3	Design methods and equipment for solid waste management to minimize environmental impact.
				CO4	Analyze and evaluate hazardous waste characteristics and their environmental impacts.
				CO5	Design appropriate disposal systems for effective hazardous waste management.
47	VIII	Artificial Intelligence	BEETC-801PE	CO1	Explain the fundamentals, evolution, and components of Artificial Intelligence and its role in society.
				CO2	Apply logic-based techniques and search strategies to solve AI problems and game scenarios.
				CO3	Analyze machine learning paradigms and algorithms for reasoning and learning from data.
				CO4	Describe the structure and function of artificial neural networks and foundational concepts of deep learning.
				CO5	Identify AI development platforms, tools and programming languages used in industry applications.
48	VIII	MEMS	BEETC-801PE	CO1	Describe the fundamental concepts, benefits, and diverse applications of MEMS.
				CO2	Explain micro-fabrication and micromachining processes for MEMS device fabrication.
				CO3	Analyze surface micromachining techniques and their requirements in MEMS device fabrication.
				CO4	Explain recent advancements in the field of RF MEMS devices.
				CO5	Classify physical micro-sensors and their integration in smart sensor systems.
49	VIII	Android Mobile Application Development	BEETC-802PE	CO1	Identify various concepts of mobile programming that make it unique from programming for other platforms.
				CO2	Critique mobile applications on their design pros and cons.
				CO3	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces.
				CO4	Program mobile applications for the Android operating system that use basic and advanced phone features.
				CO5	Deploy applications to the Android marketplace for distribution.
50	VIII	Project Phase-II	BEETC-803P	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.