Society for Computer Technology and Research's

Pune Institute of Computer Technology

Department of Electronics & Telecommunication Engineering

COURSE OUTCOMES

Second Year (2019 Pattern) Semester I

207005: Engineering Mathematics III	
Students will be able to:	
207005.1	Solve higher order linear differential equations which are essential in modeling and analyzing electrical circuits.
207005.2	Obtain Fourier Transform of continuous functions which is useful in Signal processing. Find Z Transform of discrete functions which is involved in image processing.
207005.3	Compute interpolating polynomials, numerical differentiation and integration, numerical solutions of ordinary differential equations used in modern scientific computing.
207005.4	Explain concepts of gradient, curl, divergence to identify the nature of scalar and vector fields.
207005.5	Define line, surface and volume integrals. Evaluate vector integrals by using Green's lemma, Gauss Divergence theorem and Stoke's theorem.
207005.6	Analyze Complex functions, Conformal mappings, Contour integration applicable to electrostatics, signal and image processing.

204181: Electronic Circuits	
Students will be able to:	
204181.1	Draw and explain the construction, characteristics and parameters of EMOSFET towards its application as an amplifier
204181.2	Design MOSFET amplifiers, with and without feedback, & MOSFET oscillators, for given specifications. Compute the performance parameters.
204181.3	Design and describe the working of linear and switching regulators, with their variants. Compute the performance parameters like load and line regulation, regulated voltage etc.
204181.4	Explain internal schematic of Op-Amp; define and determine its performance parameters. Design Op-amp based analog applications like Schmitt trigger, Integrator, differentiator Instrumentation amplifier etc.
204181.5	Describe various data conversion techniques with its principle and PLL with their applications.

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COURSE OUTCOMES

204182: Digital Circuits	
Students will be able to:	
204182.1	Explain and compare the characteristics of the logic families and Draw the interfacing circuits (TTL to CMOS and vice-versa)
204182.2	Design, Analyze and Implement the various combinational logic circuits to verify their function table.
204182.3	Design, Analyze and Implement the various sequential circuits to verify their state table
204182.4	Define and compare the state machine and Develop the FSM using Mealy Moore machine representations.
204182.5	Categorize various types of memories and PLDs. Design the combinational logic circuits using PLDS.

204183: Electrical Circuits	
Students will be able to:	
204183.1	Select the techniques & tools such as nodal analysis, mesh analysis, Thevenin's, Norton's, Superpositions, Maximum Power transfer theorems, and transformations to solve the electrical circuits. Determine the voltages, currents, power and impedances with given circuit conditions.
204183.2	Formulate and analyze the driven and source free RL and RC circuits. Solve for RL & RC circuits to find transient responses in mathematical form.
204183.3	Formulate the network equations, parameters for given network and analyze the given network using Laplace Transform to find the network transfer function.
204183.4	Identify various types of motors, their construction, speed controlling techniques & characteristics. Derive the voltage current relations along with speed, torque, slip, efficiency, emf equations of the various motors and apply in problem solving. List the correct motor with respect to their application.

COURSE OUTCOMES

204184: Data structures	
Students will be able to:	
204184.1	Find different data types (primary, secondary, etc.), constants, variables, keywords, pointers, functions, function types, return type, arguments, call by value, call by reference and return by reference. List the different data types, data structures, memory sizes and ranges, storage types, sorting and searching methods, asymptotic notations, stack and queue operations, linked lists, trees, and graphs. Select the correct data type, operators, format specifiers, escape sequence to represent data in the required formats. Choose data structures for C program to implement stack, queue, linked list. Recall several conditional and decision-making approaches, exchanging strategies and compare their benefits and drawbacks. Recognize different data structures and use them to manipulate provided data sets.
204184.2	Discuss the operators, pointers, and functions needed to operate on the array, string, linked list, stack, queue, tree, and graph. Give one or more programming examples that manage the data items in an array, string, linked list, stack, queue, tree, or graph. Explain how dynamic memory allocation, pointers, and functions are used in data operations. Differentiate and briefly describe the effects of static and dynamic memory allocation, with and without pointers. Describe how an array and linked list are used to represent a stack, queue, tree, or graph.
204184.3	When organizing data elements, use linked lists, arrays, and structural unions. In order to modify data components, select and use a variety of data types, pointers, and files. Use C programs to demonstrate different operations on data items in order to solve scientific and mathematical issues using algorithms and to examine data items using menu-driven user choices. To analyze operations on data items in various scenarios, identify data types, data structures, and functions. Also investigate the best, worst, and average scenarios to enhance algorithm performance. Use the dot and arrow operators to test and highlight data passing and argument passing in order to illustrate memory management and effective data handling techniques.
204184.4	Examine the impact of pointers on the operations of different data structures. To conform to computing concepts like complexity (time and space), and memory management, construct a C program using a variety of function types, pointers, and operators. Compose a C problem statement that deals with accessing data items in linear and nonlinear data structures. Formulate a C program to perform a variety of mathematical operations on data objects, including logical, relational, string, and polynomial operations.
204184.5	Compare various techniques to invoke functions with and without pointers, initialize and access data members in various data structures. Justify the effect of dot and arrow operators on accessing data members. Interpret dynamic and static memory operations to support various data manipulation operations. Recommend suitable data structures for data operation to evaluate algorithm behaviors through C programs to verify effect of various cases in organizing data elements (sorting, searching, comparing), argument types, passing by values and reference to various function calls.

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COURSE OUTCOMES

204185: Electronic Circuits Lab	
Students will be able to:	
204185.1	Design and implement a single stage MOSFET CS amplifier, Voltage regulator and measure different parameters like Rif, Rof, Avf , bandwidth, load regulation, line regulations etc.
204185.2	Measure different Op- amp parameters and compare with data sheet values. Also, design built & test Op-amp application circuit (e.g., Integrator, R-2R Ladder DAC, Instrumentation amplifier)
204185.3	Simulate analog circuit (MOSFET current series feedback amplifier, virtual ground and virtual short concept, OP-AMP application circuits i.e., Square and triangular waveform generator, Schmitt trigger etc.) and measure its different parameters.

204186: Digital Circuits Lab	
Students will be able to:	
204186.1	Explain and compare the characteristics of the logic families and Draw the interfacing circuits (TTL to CMOS and vice-versa)
204186.2	Design, Analyze and Implement the various combinational logic circuits to verify their function table.

204187: Electrical Circuits Lab	
Students will be able to:	
204187.1	Apply the simplification techniques & tools to analyze the electrical circuits to compute the voltage, currents, power and impedance, initial conditions, two port network parameters & network functions.
204187.2	Identify various types of motors, their construction, speed controlling techniques & characteristics. Demonstrate & test the voltage current relations to measure speed & determine, torque, slip, efficiency of DC & AC motors. To comprehend and write the laboratory record to conclude individually.
204187.3	Illustrate the implementation of electrical systems through case study / industrial visit

COURSE OUTCOMES

204188: Data structures Lab	
Students will be able to:	
204188.1	List suitable datatype and decision-making statements, logical and mathematical operators needed for desired code. Choose an appropriate type and operator from the list. Write an algorithm and a C program (with or without using function) to implement linear and nonlinear data structures using it. Perform various operations such as insert, delete, modify, and search to manipulate data items in a given dataset. Perform operations with and without use of pointer variables.
204188.2	Compile to examine syntactical and logical errors. Evaluate the operation of developed code by various test cases using available modern tools. Verify and report the observation with demonstration, errors reported by the compiler, and remedy taken to resolve the error in experiment writeups by drawing effective conclusions. State space and time complexity if any for the developed code.

204189: Electronic Skill Development	
Students will be able to:	
204189.1	Identify and characterize the electronic circuit components and their specifications. Design and implement analog and digital circuits on breadboard.
204189.2	Describe the architecture of Arduino Board and interface different peripherals and sensors.
204189.3	Design and Implement PCB layout of electronic circuits.
204189.4	Demonstrate electronics test and measuring instruments for testing of electronic circuits.
204189.5	Explain different types of renewable and nonrenewable power sources.

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COURSE OUTCOMES

Second Year (2019 Pattern) Semester II

204191: Signals & Systems	
Students will be able to:	
204191.1	Identify and classify basic signals such as unit impulse, unit step, unit ramp, etc. on the basis of mathematical description. Perform mathematical operations on dependent and independent variables of a given deterministic signal. Express the given physical signals as mathematical functions in terms of standard signals. Classify the systems based on their properties for given system characterized in terms input output relation and impulse response.
204191.2	Analyze linear time invariant system to determine the output signal for a given system impulse response and arbitrary input using convolution integral and sum.
204191.3	Analyze and resolve the periodic signals in frequency domain using Fourier series. Determine and sketch the amplitude and phase spectrum.
204191.4	Analyze and resolve the signals in frequency domain using Fourier Transform. Determine and sketch the amplitude and phase spectrum of the signals.
204191.5	Given a time domain signal, determine Laplace Transform and Draw it's ROC. Given an impulse response of LTI system, infer the stability and causality using Laplace transform and its properties.
204191.6	Compute the probability of a given event. Compute the CDF, PDF and determine statistical averages for given random variable.

204192: Control Systems	
Students will be able to:	
204192.1	Obtain the transfer function of a control system using mathematical modeling, block diagram reduction and signal flow graphs.
204192.2	Analyze the time domain response of a control system to obtain performance parameters like steady state error, static error coefficients, rise time, peak time, peak overshoot, settling time & delay time.
204192.3	Determine, analyze and comment on closed loop stability of a control system using Routh-Hurwitz criterion and Root locus technique.
204192.4	Perform frequency domain analysis of control systems by obtaining frequency domain specifications like resonant frequency, resonant peak and bandwidth. Determine and analyze closed loop stability by sketching frequency domain plots (Bode plot and Nyquist plot). Calculate gain margin and phase margin.
204192.5	Obtain state equations, state diagram, state transition matrix and canonical forms for a control system using state space method
204192.6	Analyze the characteristics of PID controller in P, I, D, PI, PD & PID modes. Explain Zeigler Nicholas method for tuning a PID controller. State the concept of Industrial automation and need of IoT based industrial automation.

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COURSE OUTCOMES

204193: Principles of Communication Systems	
Students will be able to:	
204193.1	Identify various blocks of a typical communication system and explain the significance and relevance of each block. Determine the exponential Fourier Series and Fourier Transform for a given time domain signal and sketch the phase and amplitude spectrum. Compute energy, power, and bandwidth of a typical signal from its frequency domain specifications such as ESD and PSD. Analyze and determine the input-output relation (in time as well as frequency domain) for an LTI system.
204193.2	Define various types of amplitude modulation techniques and analyze them in time and frequency domain. Explain different ways to generate and detect them. Compare them based on their power requirement, bandwidth, and hardware complexity.
204193.3	Define, analyze frequency, and phase modulation mathematically and understand the relation between them. Explain various ways to generate and detect them. Compare Frequency modulation, Phase modulation and Amplitude modulation techniques based on their bandwidth, power, modulation index, applications, hardware complexity and operating frequencies.
204193.4	Define sampling process, sampling theorem for low pass signal. Sketch the frequency spectrum of a sampled signal for ideal, natural, and flat top sampling. Describe different types of pulse analog modulation techniques with their generation and detection methods.
204193.5	Explain uniform and non-uniform quantization process in the digitization of analog message signal into digital signal. Draw and explain the typical block diagrams of various waveform coding schemes such as PCM, DM and ADM modulators and demodulators.
204193.6	Identify the need of Multiplexing, Synchronization and Equalization in digital communication. Design a Scrambler and Un-scrambler to remove long and periodic bit pattern in the given message. Distinguish various Line Codes such as Polar, Unipolar and Manchester based on their PSDs, transparency, and PDC error detection capability.

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COURSE OUTCOMES

204194: Object Oriented Programming	
Students will be able to:	
204194.1	Define and declare various class (base, derived, static, polymorphic, inherited, and singleton, etc.) member functions (private, public, and protected), function types as well as return type, arguments, virtual, inline, friend, call by value, call by reference, and return by reference. Operator overloading (unary, binary, and other), function overloading, identifiers, and specifier, Choose the appropriate one from those needed for an object-oriented program. Recall procedural, modular, object-oriented and generic programming techniques, compare them in terms of advantages and disadvantages. State limitations of structural programming paradigm and describe data encapsulation, data abstraction and information hiding, inheritance, polymorphism techniques with reference to object-oriented programming. Select various constructors, overloading operators, type of inheritance, and operations on files to demonstrate through C++ program. List various data type, their memory storage and ranges, storage classes, operators (such as memory management operators, member dereferencing operators, typecast operators, scope resolution operators etc.), and exception handling techniques supporting to C++ programming.
204194.2	Classify function, class, member functions, operators, exception handling techniques based on their declaration, definition, and functioning. Discuss various programming paradigms to highlight their specialty, dependencies, and requirements. Also, types of constructors, destructor, inherited classes, polymorphic classes, file operation with error handling, operator and function overloading concepts used in object-oriented programming. Give example/s of programming paradigms, accessing public, private and protected members and functions of classes, operator and function overloading using dot, arrow, and scope resolution operators, memory management operators. Explain use of constructor, destructor, inline and friend functions, relationship between derived and base classes, their objects, these pointers, templates, and exceptions using C++ programming concepts. Convert some programs that uses basic data types, variables, constants, decision making, and menu driven controls, file handling, array operation (on number and characters) such as create, display, insert, delete, modify, search etc. performed using structural programming (C-language) to C++ program. Distinguish and summarize impact of member access operators with and without pointers, memory requirements and memory management.
204194.3	Use the class, object, member operator, constructor, function, inheritance, polymorphism, abstraction, and encapsulation concepts for hiding information from users while organizing data items safely. With the aid of C++ programs, Choose and employ classes, objects, and files to manipulate data and demonstrate inheritance, polymorphism, abstraction, and encapsulation using data elements. C++ programs to solve mathematical and science problems through algorithms and modify data items using menu driven choice selected by user. Write C++ programs to modify data items using menu-driven user selection to answer mathematical and scientific issues.
204194.4	Find classes, objects, specifiers, and identifiers to examine function and operator overloading, inheritance, polymorphism, encapsulations, exceptions, files, templates, and data abstractions. Also, investigate different access methods for data members, member functions, and other classes. To demonstrate memory management and efficient data security strategies, use the dot, arrow, and scope operators to test and point out object passing, arguments passing, and practical variations.

COURSE OUTCOMES

204194.5	Write a C++ program, combine constructors, destructors, and a variety of operators and functions to adhere to object-oriented computing principles like inheritance, abstraction, encapsulation, and polymorphism. Compose a problem statement for a C++ program that addresses data hiding and security methods. Formulate a C++ program to carry out mathematical operations on data items, such as complex number operations, string operations, relational operations, and logical operations.
204194.6	Compare various techniques to invoke functions, initialize and access data members in private and public part of class. Justify the effect of dot, arrow and scope operator on accessing data members and member function in class, inheritance and polymorphism. Interpret inheritance of derived classes and base classes, exceptions, file operations to support various data manipulation operations. Evaluate methods, data items behaviors through C++ programs to conclude effect of overloading, initializations, arguments, passing by values and reference to various function calls, inheritan ce and polymorphisms.

204195: Signals & Control System Lab (Control System)	
Students will be able to:	
204195.CS1	Obtain the transfer function of a control system using mathematical modeling, block diagram reduction techniques and signal flow graphs
204195.CS2	Compute performance parameters like steady state error, static error coefficients for first order control systems. Calculate time domain and frequency domain specifications such as rise time, peak time, peak overshoot, settling time, delay time, resonant frequency, resonant peak and bandwidth for the given system.
204195.CS3	Solve higher order characteristics equations using Routh-Hurwitz criterion to determine the closed loop stability. Sketch and simulate Root locus /Bode plot /Nyquist Plot to compute performance parameters and comment on closed loop stability from given OLTF.
204195.CS4	Obtain state equations, state diagram, state transition matrix and canonical forms for a control system using state space method.

COURSE OUTCOMES

204195: Signals & Control System Lab (Signals and System)	
Students will be able to:	
204195.SS1	Write codes to generate and plot the fundamental signals in octave in time domain and sketch their amplitude and phase spectrum. Perform convolution operation on unit step and exponential signals and plot the output response.
204195.SS2	Apply different sampling rates on human voice or speech signal and observe the effect of aliasing.
204195.SS3	Analyze the speech signal in time domain by plotting amplitude and phase spectrum.
204195.SS4	Compute the Fourier Series coefficients of periodic signal using exponential or trigonometric fourier series method. Reconstruct the time domain signal from fourier series coefficients and observe the Gibb's phenomenon.

204196: Principles of Communication Systems Lab	
Students will be able to:	
204196.1	Draw a block diagram of AM and transmitter and receiver. Generate AM (DSB-FC), Calculate of modulation index by graphical method, Power of AM Waveform for different modulating signal and observe and sketch AM Wave for different modulating signal and Spectrum. Draw, Frequency modulator & demodulator using Varicap/Varactor Diode and NE 566 VCO, IC 565 (PLL based detection), calculate modulation index & BW of FM, Observe and Sketch the FM waveform and spectrum
204196.2	**Perform** the experiment to **generate** PCM, Companded PCM, DM and Line codes, **sketch** their waveforms. **Determine** the signaling rate and bandwidth of PCM, Companded PCM, DM and Line codes.
204196.3	**Simulate** and **verify** Sampling Theorem using Octave/LabVIEW, **simulate** PCM and **calculate** signal-to-noise ratio for PCM/DM system. **Demonstrate** Scrambling and descrambling operation either using Octave/LabVIEW simulations.

COURSE OUTCOMES

204197: Object Oriented Programming Lab	
Students will be able to:	
204197.1	Define, list, choose and declare various class (base, derived, static, polymorphic, inherited, and singleton, etc.) member functions (private, public, and protected), function types as well as return type, arguments, virtual, inline, friend, call by value, call by reference, and return by reference. Operator overloading (unary, binary, and other), function overloading, identifiers, and specifier. Choose the appropriate one from those needed for an object-oriented program. Select various constructors, overloading operators, type of inheritance, and operations on files to demonstrate through C++ program. List various data type, their memory storage and ranges, storage classes, operators (such as memory management operators, member dereferencing operators, typecast operators, scope resolution operators etc.), and exception handling techniques supporting to C++ programming. Write journal/report to conclude effectively.
204197.2	Classify, and Discuss function, class, member functions, operators, exception handling techniques based on their declaration, definition, and functioning. Types of constructors, destructor, inherited classes, polymorphic classes, file operation with error handling, operator and function overloading concepts used in object-oriented programming. Give example/s of programming paradigms, accessing public, private and protected members and functions of classes, operator and function overloading using dot, arrow, and scope resolution operators, memory management operators. Explain use of constructor, destructor, inline and friend functions, relationship between derived and base classes, their objects, these pointers, templates, and exceptions using C++ programming concepts. Write journal/report to conclude effectively.

204198: Data Analytics Lab	
Students will be able to:	
204198.1	Given a data set, identify appropriate Python libraries, and describe their uses to import (export) the data from (to) multiple sources in Python. Demonstrate and analyze the imported data set in Python using Pandas.
204198.2	Classify the variables in the given data set as either qualitative or quantitative. Explain various plots for data visualization and describe their uses. Demonstrate the data visualizations in Python using Matplotlib and Seaborn.
204198.3	Identify the need of various preprocessing tasks to the given messy and complex data and demonstrate the same in Python using appropriate libraries.
204198.4	Analyze the given data using Exploratory Data Analysis (EDA) techniques to better understand the distribution of the data. Compute descriptive statistics measures, illustrate the basics of grouping, and describe the data correlation processes and An analysis of Variance (ANOVA) and implement them using Python.

204198.5	Define the explanatory variable and the response variable. Create and compare the simple linear regression and multiple linear regression models, evaluate the created data model by using visualization, describe the use of R-squared and MSE for in-sample evaluation and demonstrate them using Python.

204199: Employability Skill Development	
Students will be able to:	
204199.1	Define personal and career goals (short-term and long-term) using introspective skills and Perform SWOC assessment.
204199.2	Demonstrate effective communication skills through Group Discussion, Extempore Speech, Presentation, self-management attributes, problem solving abilities and team working & building capabilities.
204199.3	Analyze multi-cultural environment and Exhibit leadership skills by improving interpersonal relationships and conflict management.
204199.4	Exhibit professional ethics, etiquettes & morals. Demonstrate the skill set involving lateral & critical thinking, effective presentations, and leadership qualities.

204200: Project Based Learning	
Students will be able to:	
204200.1	Identify the real-world problem through literature survey and plan to execute a Project with group members. Carry out project in a team, formulate and present project concept based on interest, literature survey, recent trends and real-life examples.
204200.2	Implement fundamental concepts of electronics and communication engineering like electronic hardware by learning PCB artwork design, soldering techniques and testing etc. Identify appropriate solution and implement it using electronic hardware/software principles. Demonstrate the use of modern tools for simulation and implementation of the system.
204200.3	Prepare a project report based on the project-based learning. Comprehend and write a project report and summarize conclusions at a technical level.
204200.4	Demonstrate the working principle of the implemented project in oral and written form and exhibit designed system. Analyze the performance parameters and results of the system as per defined specifications.