COURSE SYLLABUS

FOR

SEMESTER-III

B.E.
ELECTRONICS & TELECOMMUNICATION ENGINEERING

(W.E.F. 2021-22)

Course Code	Course Title	Hours / Week			Credits	Maximum Marks			ESE
		L	T	P		Continuous Evaluation	End Sem. Exam	Total	Duration (Hrs.)
PCCET301T	Electronic Devices and Circuits	3	1	0	4	40	60	100	3

Course Objectives
The objectives of this course are to provide students with:
1. The basic concepts of Electronic Devices and Circuits.
2. An ability to interpret and analyze the characteristics of electronic devices and their utility.
3. Skills to design, simulate and analyze electronic circuits to provide exposure on industrial applications and their importance in the real world.

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO1	**Understand:** Understand the performance parameters of Transistor and Operational Amplifier in electronic circuits.
CO2	**Apply:** Comprehend various biasing methods and apply the concept of feedback to improve circuit performance.
CO3	**Analyze:** Design and analyze transistorized amplifiers and oscillators for analog systems.
CO4	**Analyze:** Design and analyze linear and non-linear applications of Operational Amplifier.
CO5	**Apply:** Design and develop electronic systems for given applications.

SYLLABUS

Unit I: Bipolar Junction Transistor

Introduction, Biasing circuits, Stability factor, Compensation techniques, h-parameter model and analysis of transistor amplifier circuits, Common base, Common emitter, Common collector amplifier configurations and performance factors, Applications using transistor as switch.

Unit II: Amplifiers and Oscillators

Introduction to feedback amplifiers, Types of negative feedback amplifiers, Effect of negative feedback, Introduction to power amplifiers, Types of power amplifiers: class A, B, C & AB; Design of power amplifiers, Oscillators: Audio and RF frequency oscillators; Circuit simulation.

Unit III: Field Effect Transistor

Introduction, JFET and its characteristics, MOSFET and its characteristics, MOSFET amplifiers: Biasing, Small signal analysis; MOS spice model, Introduction to CMOS, Simulation of CMOS inverter and logic gates.

Unit IV: Operational Amplifier Differential amplifier, DC and AC analysis, Operational amplifiers (OP-AMP): Data sheet interpretation, Parameters, Voltage transfer curve, Open loop and closed loop OP-AMP configuration, Concept of virtual ground, Inverting amplifier, Non-inverting amplifier and Voltage follower.
Unit V: Linear and Non-Linear Applications of Operational Amplifier Summing amplifier, Instrumentation amplifier and applications, Integrator and differentiators (Practical considerations and design), Peak detector, Comparator, Schmitt trigger, Precision rectifier, Introduction to IC-555, Design of active filters, Circuit simulation.
Unit VI: Industrial Applications of Electronic Circuits Product specification sheet and testing, Linear power supply, 12V Flasher, Temperature controller, OP-AMP based electrocardiogram (ECG) signal acquisition and beats per minute (BPM) measurement, Speed control of a DC motor using OP-AMP.

Text Books Recommended
1. "Electronic Devices and Circuits", J. Millman and Halkias, 3rd Edition, 2010, TMH Publications.
2. "Electronic Devices & Circuit Theory", Boylestad & Nashelsky, 11th Edition, 2017, PHI Publications.
3. "Op-Amps and linear Integrated Circuits", Ramakant A. Gayakwad, 4th Edition, 2000, PHI Publications.
4. "Electronic Devices", Thomas L. Floyd, 10th Edition, 2018, Pearson.

Reference Books Recommended
1. "Integrated Electronics, Analog & Digital Circuits & Systems", J. Millman and Halkias, 2nd Edition, 2010, TMH Publications.
2. "Micro Electronic Circuits", Sedra & Smith, 5th Edition, 2004, Oxford University Press.
3. "Design with Operational Amplifiers and Analog Integrated Circuits", Sergio Franco, 3rd Edition, 2002, TMH Publications.
4. "Op Amps Design Application and Troubleshooting", David L Terrel, 2nd Edition, 1996, Elsevier Science (USA).

Course Code	Course Title	Hours / Week			Credits	Maximum Marks			ESE
		L	T	P		Continuous Evaluation	End Sem. Exam	Total	Duration (Hrs.)
PCCET301P	Electronic Devices and Circuits Lab	0	0	2	1	25	25	50	-

Course Objectives
The objectives of this course are to provide students with:
1. An ability to interpret data sheet, understand and analyze the characteristics of electronic devices and their utility.
2. Skills to design, simulate, implement and analyze electronic circuits used in industrial applications.

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO1	**Analyze:** Interpret data sheet and analyze the performance parameters of transistors and operational amplifier.
CO2	**Analyze:** Design and analyze amplifiers, oscillators, linear and non-linear applications of operational amplifier.
CO3	**Apply:** Build and troubleshoot electronic systems for given applications.

Sr. No	List of Experiments
1	Introduction to laboratory.
2	Design of transistor biasing circuit and analysis of effect of temperature on it.
3	Plot static characteristics of BJT configurations and determine h-parameters.
4	Studies on BJT CE Amplifier using virtual lab.
5	Design a circuit to control home appliances with the help of BJT and IR sensor.
6	Design and simulate feedback amplifiers and compare their performance parameters.
7	Design and simulate power amplifiers and compare their performance parameters.
8	Plot drain and transfer characteristics of n-channel Junction Field Effect Transistor (JFET) and find g_m, r_d and μ from the characteristics.

9	Plot drain and transfer characteristics of n-channel Metal Oxide Semiconductor Field Effect Transistor (MOSFET) and find V_T, g_m and r_o from the characteristics.
10	Implement inverting and non-inverting amplifier, and inspect the effect of change in frequency on gain.
11	Study of basic properties of operational amplifier: inverting and non-inverting amplifiers using virtual lab.
12	Study of operational amplifier based Differentiator and Integrator using virtual lab.
13	Design and simulate integrator circuit, and determine the band of frequency for faithful integration.
14	Design and simulate differentiator circuit, and determine the band of frequency for faithful differentiation.
15	Design precision rectifier circuit using operational amplifier.
16	Design and test 5V linear power supply, and outline its specification sheet.
17	Design and test 12V Flasher circuit, and outline its specification sheet.
18	Design and build an operational amplifier based circuit to control speed of a DC motor.
19	Design operational amplifier based circuit for ECG signal acquisition and BPM measurement.
20	Design and implement PWM based light intensity controller.
21	Open ended experiment.

***A minimum of eight experiments to be performed based on the above list with minimum one experiment on virtual lab wherever possible.**

Suggested References:

1. "Electronic Devices and Circuits", J. Millman and Halkias, 3rd Edition, 2010, TMH Publications.
2. "Electronic Devices & Circuit Theory", Boylestad & Nashelsky, 11th Edition, 2017, PHI Publications.
3. "Op-Amps and linear Integrated Circuits", Ramakant A. Gayakwad, 4th Edition, 2000, PHI Publications.
4. "Electronic Devices", Thomas L. Floyd, 10th Edition, 2018, Pearson.
5. https://nptel.ac.in/courses/108/108/108108125/
6. http://vlabs.iitkgp.ac.in/be/

Course Code	Course Title	Hours / Week			Credits	Maximum Marks			ESE
		L	T	P		Continuous Evaluation	End Sem. Exam	Total	Duration (Hrs.)
PCCET302T	Digital Electronics	3	1	0	4	40	60	100	3

Course Objectives
The objectives of this course are to provide students with:
1. An ability to apply the fundamental knowledge of digital circuits for circuit optimization and designing of various digital systems.
2. An ability to design various combinational and sequential logic circuits.
3. An aptitude to implement digital systems on Programmable Logic Devices.

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO1	**Analyze**: Understand and analyze logic gates, Boolean algebra and logic families for circuit minimization and designing of digital circuits.
CO2	**Apply:** Simplify, design and develop combinational logic circuits for various applications.
CO3	**Apply:** Simplify, design and develop sequential logic circuits for various applications.
CO4	**Apply:** Comprehend and make use of Programmable Logic Devices to develop digital systems.

SYLLABUS

Unit I: Fundamentals of Digital Electronics & Circuit Optimization

Number System, Logic gates and their truth tables, Boolean algebra, De-Morgan's Theorem, 1's and 2's complement and their subtraction method, Gray, BCD and ASCII codes; BCD Addition & Subtraction.
Logic Families: Introduction, Characteristics: Fan-in, Fan-out, Propagation delay, Power dissipation, Noise margin, Timing issues; Comparison of different logic families.
Digital Circuit Optimization: Basic and Universal implementation of Boolean expression using logic gates, Standard representations of logic functions, Minimization and realization of logic functions using k-map (up to 4 variables), Code convertors.

Unit II: Combinational Circuits

Design of Arithmetic Circuits: Half & Full adders, Half & Full subtractors, Carry look ahead adder; Multiplexers, De-multiplexers, Encoders, Decoders, BCD to seven segment decoder, Comparator, Parity checkers. Introduction to digital ICs and Datasheet interpretation, Validation through simulation software.

Unit III: Sequential Circuits-I

Introduction to flip flops, Types of flip flops: S-R, J-K, D, T and Master-Slave; Concept of preset and clear, Characteristics and excitation table of flip flops, Conversion of flip flops, Timing and Clocking issues: Setup and Hold time, Rise and Fall time, Metastability, Clock skew & jitter.

Unit IV: Sequential Circuits-II Registers, Applications of registers: Ring counter, Twisted Ring/Johnson counter; Counters: Asynchronous/Ripple counters, Synchronous counters, Modulo counters, Lock-free Counters, Applications of counters, Counter ICs & Datasheet interpretation, Validation through simulation software.
Unit V: Convertors & Programmable Logic Devices Analog to Digital Convertor (ADC), Digital to Analog Convertor (DAC), Memory organization and operation, ROM as a Programmable Logic Devices (PLD), Programmable Logic Array (PLA), Programmable Array Logic (PAL), Complex Programmable Logic Devices (CPLD), Field Programmable Gate Array (FPGA), Logic implementation using PLD.
Unit VI: Finite State Machines Introduction, State diagram, State Table, State assignment, Finite State Machine (FSM): Mealy & Moore machine representation and implementation, Applications of FSM.

Text Books Recommended
1. "Modern Digital Electronics", R. P. Jain, 3rd Edition, 2003, Tata McGraw Hill Publishing Company Limited.
2. "Digital Design", Morris Mano, 5th Edition, 2001, Pearson Publications.
3. "Fundamentals of Digital Circuits", A. Anand Kumar, 4thEdition, 2009, Prentice Hall of India Private Limited.
4. "Digital Fundamentals", Thomas L. Floyd, 11th Edition, 2015, Pearson Publications.

Reference Books Recommended
1. "Fundamentals of Logic Design", C. H. Roth & Larry L. Kenny, 6th Edition, 2014, Cengage Learning.
2. "Digital Electronics- An Introduction to Theory and Practice", William H. Gothmann, 2nd Edition, 2008, Prentice Hall of India Private Limited.
3. "Digital Design: Principles and Practices", John Wakerly, 4th Edition, 2006 Pearson Education Publications.
4. "Digital Principles & Applications", Malvino, 7th Edition, 2011, Tata McGraw Hill Education Private limited.

Course Code	Course Title	Hours / Week			Credits	Maximum Marks			ESE
		L	T	P		Continuous Evaluation	End Sem. Exam	Total	Duration (Hrs.)
PCCET302P	Digital Electronics Lab	0	0	2	1	25	25	50	-

Course Objectives
The objectives of this course are to provide students with:
1. An ability to design, develop and analyze various combinational and sequential circuits.
2. A skill set of modern tools to simulate and analyze digital circuits.
3. A capability to build digital circuits on Programmable Logic Devices.

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO1	**Apply:** Design, implement and verify various combinational logic circuits for given boolean logic.
CO2	**Apply:** Examine the behavior of flip flops for designing Synchronous and Asynchronous circuits and validate using modern tools.
CO3	**Apply:** Make use of Programmable Logic Devices for implementing various digital circuits.

Sr. No	List of Experiments
1	Introduction to laboratory.
2	a. Design & implement a circuit that adds 2 binary bits using Ex-OR and basic gates. b. Design, implement and simulate a circuit that adds 3 binary bits using Ex-OR and basic gates.
3	a. Datasheet interpretation of IC-74LS83 as a BCD adder. b. Design and implement 1-digit BCD adder using IC-74LS83. c. Design and implement 4-bit Binary subtractor using IC-74LS83.
4	Implement BCD to Excess-3 code converter using NAND gates and verify the truth table.
5	A person has locker which has three key slots and the locker will open if two or more than two keys are connected, draw the truth table and design the combinational circuit for the same.
6	a. Design a combinational circuit that converts a four bit binary number to four bit reflected code number. Implement the circuit using only Ex-OR Gate. b. Design a 4 bit Gray to Binary code convertor. c. Verify the same using Virtual lab.

7	a. Datasheet interpretation of IC-74LS153 as a Multiplexer. b. Design and implement 8:1 MUX using IC-74LS153 & verify its Truth Table. c. Design and implement the given 4 variable function using IC-74LS153. Verify its Truth-Table.
8	a. Datasheet interpretation of IC-74LS138 as a De-multiplexer. b. Design and implement 1:8 De-multiplexer using IC-74LS138 & Verify its Truth Table. c. Implement the digital communication system using Multiplexer and De-multiplexer.
9	a. Datasheet interpretation of IC-74LS138 as a Decoder. b. Design and implement full adder and subtractor function using IC-74LS138. c. Design and implement 3-bit code converter using IC-74LS138. (Gray to Binary/Binary to Gray).
10	a. Datasheet interpretation of driver IC-7447. b. Implement BCD to seven segment Decoder using driver IC-7447 and LED display. Also display the numbers 0 to 9 on it.
11	Implement and simulate S-R, J-K, D and T types Flip-Flop using Universal Gates and verification of their truth table.
12	Perform conversion of S-R Flip-Flop into J-K Flip-Flop and verify the Truth Table.
13	a. Datasheet interpretation of Shift Register ICs (74HC194 / 74LS95). b. Design, implement and simulate 4 bit Ring Counter using flip flops and draw the timing diagram. c. Design and implement 4-bit Ring Counter/ Twisted ring Counter using shift registers IC-74HC194 / IC-74LS95.
14	Realize & simulate 4 Bit parallel in serial out shift register using D flip flop. Also verify the result using IC-7495.
15	a. Datasheet interpretation of counter ICs (74LS90 / 74LS93). b. Design and implementation of MOD-N using IC-74LS90 and draw the timing diagram. c. Design and implementation of MOD-N using IC-74LS93 and draw the timing diagram.
16	A lift is to be installed that will allow only 10 persons to enter. If 11th person enters then the lift doors will be closed. Design the counter for the same.
17	Design and implement 4-bit Up/Down Counter and MOD-N Up/Down Counter using IC74HC191 / IC74HC193. Draw timing diagram.
18	Implement the Boolean logic function on PLA.
19	Verification of Water level control using Virtual Lab.
20	Verification of NOR Gate and its application in automobile alarm system using Virtual Lab.
21	Verification of Cockpit warning light control using basic logic gates using Virtual Lab.
22	Open ended experiment.

***A minimum of eight experiments to be performed based on the above list with minimum one experiment on virtual lab wherever possible.**

Suggested References:
1. "Digital Fundamentals", Thomas L. Floyd, 11th Edition Global Edition, 2015, Pearson Publications.
2. "Fundamentals of Logic Design", C. H. Roth & Larry L. Kenny, 6th Edition, 2014, Cengage Learning.
3. "Digital Electronics- An Introduction to Theory and Practice", William H. Gothmann, 2nd Edition, 2008, Prentice Hall of India Private Limited.
4. "Digital Design: Principles and Practices", John Wakerly, 4th Edition, 2006, Pearson Education Publications.
5. "Digital Principles & Applications", Malvino, 7th Edition, 2011, Tata McGraw Hill Education Private Limited.
6. Virtual Lab Links: http://vlabs.iitb.ac.in/vlabs-dev/labs/dldesignlab/index.html http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/cool_developers/index.html http://vlabs.iitb.ac.in/vlabs-dev/labs/dldgates/index.html http://vlabs.iitb.ac.in/vlabs-dev/labs/digital_application/index.html http://vlabs.iitkgp.ernet.in/dec/ http://cse15-iiith.vlabs.ac.in/ http://he-coep.vlabs.ac.in/

Course Code	Course Title	Hours / Week			Credits	Maximum Marks			ESE
		L	T	P		Continuous Evaluation	End Sem. Exam	Total	Duration (Hrs.)
PCCET303T	Network Theory	3	1	0	4	40	60	100	3

Course Objectives
The objectives of this course are to provide students with:
1. An ability to select and apply appropriate method for the analysis of a given electrical network.
2. An ability to analyze four terminal networks using two port network functions and parameters.
3. An aptitude to design Resonant circuit and Filter network to meet the desired specification(s).

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO1	**Analyze:** Apply the knowledge of network simplification techniques and analyze a given electrical network by using Mesh & Node analysis methods.
CO2	**Apply:** Apply the concepts of Network Theorems to analyze a given electrical network.
CO3	**Apply:** Apply the concept of Laplace Transform to determine time response of a given network.
CO4	**Analyze:** Analyze Two Port Network by determining various two port network functions and parameters.
CO5	**Create:** Design a Resonant circuit and Filter network to meet the given specification(s).

SYLLABUS

Unit-I: Simplification Techniques and Mesh Analysis

Role and importance of Electrical Network Analysis in Engineering, Classification of network elements and their behavior, Concept of equivalent sources, Source transformation, Source combination, Mesh basis equilibrium equations for the network containing dependent and independent sources, Matrix approach for complicated networks, Current source shifting, mutually coupled coils, Polarity marking, Mesh equilibrium equations for the network having coupled coils, Concept of Super Mesh.

Exposure of mesh analysis using modern software tool.

Unit-II: Node Analysis and Duality

Nodal basis equilibrium equation matrix for electrical network containing dependent and independent sources, Matrix approach for complicated networks, Voltage source shifting, Concept of Super node, Principle of Duality.

Exposure of nodal analysis using modern software tool.

Unit-III: Network Theorems

Introduction and significance, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem

Unit-IV: Laplace Transform and its Application in Network Analysis

Unit-IV: Laplace Transform and its Application in Network Analysis Role and advantage of Laplace transform in system analysis, Review of Laplace transform, Concept of Initial and Final conditions, Transformed network in S-domain on Mesh and Nodal basis, Time response of electrical network with and without initial conditions, Step, Ramp and Impulse functions with and without delay and their Laplace transform, Waveform synthesis and its application in electric networks. *Realization of circuit time response though simulation platform*
Unit-V: Two Port Network Representation of two port network with standard reference, Driving point and transfer functions, Concept of Poles and Zeros of network function, Significance of poles and zeros, Time response from pole zero diagram. Two port network parameters, Condition for Reciprocity and Symmetry in terms of each parameters, Relationship between parameters.
Unit-VI: Frequency Selective Networks Resonant Circuits: Series and Parallel resonant circuits, Resonant frequency, Quality factor, Bandwidth and Selectivity, Applications of resonant circuits. Filters: Introduction to Low Pass, High Pass, Band Pass and Band Reject Filters

Text Books Recommended
1. "Network Analysis", M.E. Van Valkenburg, 3rd Edition, 2011, PHI Publications.
2. "Network and Systems", D. Roy Choudhary, 2nd Edition, 2010, New Age Publication.
3. "Linear Network Theory", Kelkar and Pandit, 1st Edition, Pratibha Publications.

Reference Books Recommended
1. "Engineering Circuit Analysis", W.H. Hayt, J.E. Kemmerly, S.M. Durbin, 8th Edition, 2012, TMH Publications.
2. "Basic Circuit Theory", Lawrance P. Huelman, 3rd Edition, 2015, Prentice Hall of India.
3. "Network Analysis and Synthesis", Franklin F. Kuo, 2nd Edition, 2008, Wiley India.
4. "Network Analysis with Applications", William D. Stanley, 4th Edition, 2003, Pearson Education Ltd.
5. "Fundamentals of Electric Circuits", Charles L. Alexander, Matthew N. D. Sadiku, 6th Edition, 2017, TMH Publication.

Course Code	Course Title	Hours / Week			Credits	Maximum Marks			ESE
		L	T	P		Continuous Evaluation	End Sem. Exam	Total	Duration (Hrs.)
PCCET304T	Object Oriented Programming & Data Structures	3	0	0	3	40	60	100	3

Course Objectives
The objectives of this course are to provide students with:
1. In-depth knowledge of object oriented programming and data structures.
2. An ability to analyze and propose solution for given problem using concepts of object oriented programming and data structures.
3. An aptitude to provide solutions to the real world application.

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO1	**Apply:** Understand and apply the concepts of object oriented programming for problem solving.
CO2	**Apply:** Identify and apply suitable data structure to a given problem statement.
CO3	**Analyze:** Apply and analyze sorting and searching techniques to a given data set.
CO4	**Create:** Design applications using the concepts of object oriented programming & data structures.

SYLLABUS

Unit I: Object Oriented Programming

Introduction, Features, Concepts, Class, Object, Data members, Member functions, Access control, Class scope, Scope resolution operator, Static member functions, Constructor & its types, Copy constructor, Destructor, Friend and Inline functions, Dynamic memory allocation.

Unit II: Overloading & Inheritance

Overloading: Introduction, Rules for function & operator overloading, Implementation of function & operator overloading, Overloading Unary & Binary operators, String handling using operators.

Inheritance: Introduction, Base and Derived classes, Types of Inheritance: Single Inheritance, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance and Hybrid Inheritance.

Unit III: Virtual Functions & Polymorphism

Pointers to objects, this pointer, Pointers to derived classes, Virtual base class, Abstract class, Virtual function, Pure virtual function, Run time Polymorphism using virtual function & inline function, Class & Function templates.

Unit IV: Arrays & Linked List Arrays: Introduction, Passing array elements, Array of pointers, Two dimensional arrays, Array as an Abstract Data Type (ADT): Definition, Operations and Representations. Linked List: Introduction, Representation of linked list in memory, Operations on linked list: Insertion, Deletion, Traversing, Searching; Doubly linked list, Circular linked list.
Unit V: Stack & Queue Stack: Introduction, Stack operations: PUSH & POP; Implementation of stack using array & linked list, Expression evaluation using stack. Queue: Introduction, Queue operations - Insert, Remove, Implementation of queue using array & link list, Circular queue, Double ended queue.
Unit VI: Sorting & Searching Techniques, Trees and Graphs Sorting techniques, Searching techniques, Time and Space complexity, Basic terminologies of tree: Forest, Depth, Height; Types of trees, Binary trees and its representation, Implementation of tree, Tree traversal methods: In-order, Pre-order & Post-order; Binary Search Tree (BST), Threaded Binary Tree, Adelson, Velski & Landis(AVL) tree, Introduction to graphs.

Text Books Recommended
1. "Object Oriented Programming with C++", E. Balagurusamy, 8th Edition, 2020, McGraw Hill Publications.
2. "Thinking in C++", Bruce Eckel, 2nd Edition, 2000, Pearson Education Publication.
3. "Object Oriented Programming with C++", David Parsons, 2nd Edition, 2002, Continnum Publication.
4. "Fundamentals of data Structures", Horowitz and Sahani, 2nd Edition, 2008, Universities Press.
5. "Data Structures using C and C++", Y. Langsam, M. Augenstin and A. Tannenbaum, 2nd Edition, 2013, Pearson Education Asia Publication.
6. "Data Structures Through C++", Yashwant Kanetkar, 2003, BPB Publications.

Reference Books Recommended
1. "Problem solving with C++ The OOP", W. Savitch, 9th Edition, 2017, Pearson Education.
2. "Object Oriented Programming in Microsoft C++", Robert Lafore, 4th Edition, 2001, Galgotia Publications.
3. "C++, the Complete Reference", Herbert Scheldt, 4th Edition, 2003, Tata McGraw Hill Publications.
4. "Theory and problems of data structures", Seymour Lipschupz, 2nd Edition, 2007, Tata McGraw Hill Publications.
5. "Data structures and the standard template library", William J Collins, 3rd Edition, 2003, Tata McGraw Hill Publications.

Course Code	Course Title	Hours / Week			Credits	Maximum Marks			ESE
		L	T	P		Continuous Evaluation	End Sem. Exam	Total	Duration (Hrs.)
PCCET304P	Object Oriented Programming & Data Structures Lab	0	0	2	1	25	25	50	-

Course Objectives
The objectives of this course are to provide students with:
1. An ability to experiment with the concepts of object oriented programming & data structures for developing various programs.
2. Skills to analyze and propose solutions to the problems using the constructs of object oriented programming, sorting-searching techniques and data structures.
3. An aptitude to develop applications using object oriented programming & data structures.

Course Outcomes	
After successful completion of this course, the students will be able to:	
CO1	**Apply:** Apply the concepts of object oriented programming and data structures to provide solutions to the given problems.
CO2	**Evaluate:** Compare and select appropriate sorting &searching techniques to the given data set.
CO3	**Create:** Develop applications based on object oriented programming & data structures.

A minimum eight practicals to be performed covering the complete syllabus of the theory course [PCCET304T].

Suggested References:
1. "Object Oriented Programming with C++", E. Balagurusamy, 8th Edition, 2020, McGraw Hill Publications.
2. "Object Oriented Programming in Microsoft C++", Robert Lafore, 4th Edition, 2001, Galgotia Publications.
3. "Data Structures Through C++", Yashwant Kanetkar, 2003, BPB Publications.