Sharad Institute of Technology College of Engineering

(An Autonomous Institute)

Yadrav (Ichalkaranji)-416121, Dist. – Kolhapur
(Approved by AICTE, New Delhi, Recognized by Government of Maharashtra &
Affiliated to BATU University, Lonere)
NBA Accredited Programs, Accredited By NAAC 'A' Grade,
ISO 9001:2015 Certified

Teaching and Evaluation Scheme for SY B. Tech.

Department of Electronics and Computer Engineering

Semester: III

Department of Electronics & Telecommunication Engineering • YADRAV •

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Yadrav (Ichalkaranji) Dist. Kolhapur

Shri Shamrao Patil (Yadravkar) Educational & Charitable Trust's

Sharad Institute of Technology College of Engineering

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Department: Electronics & Computer Engineering **Rev:**Course Structure/00/2022-23

Class: S.Y. B.Tech **Semester:** III

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
EC301	BSC	Engineering Mathematics-III	3	1	-	4	10	10	30	50	100	4
EC302	PCC	Analog Electronics	3	-	-	3	10	10	30	50	100	3
EC303	PCC	Digital Logic Design	3	-	-	3	10	10	30	50	100	3
EC304	PCC	Operating System	3	-	-	3	10	10	30	50	100	3
EC305	PCC	Data Structure using C	3	-	-	3	10	10	30	50	100	3
EC306	PCC	Analog Electronics Laboratory	-	-	2	2	15	15	-	20	50	1
EC307	PCC	Digital Logic Design Laboratory	-	-	2	2	15	15	-	20	50	1
EC308	PCC	Data Structure using C Laboratory	-	-	2	2	15	15	-	20	50	1
MDC02	MC	Environmental Sciences	2	-	-	2	25	25	-	-	50	Audit
HMS01	HSMC	Aptitude Skills - I	1	-	-	1	25	25	-	-	50	1
HMS02	HSMC	Language Skills - I	-	-	2	2	25	25		-	50	Audit
PRJ02	PROJ	Mini Project - II	-	-	2	2	25	25		-	50	Audit
		Total	18	1	10	29	195	195	150	310	850	20

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Engineering Mathematics-III

EC301	BSC	Engineering Mathematics-III	3-1-0	4 Credits

Teaching Scheme:	Examination Scheme:
Lecture: 3 hrs/week	CA-I:10 Marks
Tutorial: 1hr/week	CA-II: 10 Marks
	Mid Semester Exam : 30 Marks
	End Semester Exam: 50 Marks

Pre-Requisites: Engineering Mathematics-I & II

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the definition & properties of Laplace Transform to evaluate the integral & to find Laplace transform of elementary functions and special functions like periodic function, Dirac-delta function & unit step function.
CO2	Apply the knowledge of Laplace transformation to find solution of linear differentiation equations with constant coefficient.
CO3	Develop the concept of Fourier series expansion of different periodic functions so as to use them in harmonic analysis.& Solve problems related to Fourier transform and inverse Fourier transform.
CO4	Solve finite difference equation using Z- transform
CO5	Solve the algebraic and transcendental equations by numerical techniques and Apply numerical integration techniques whenever and wherever routine methods are not applicable.
CO6	Apply various interpolation methods and finite difference concepts.

Course Contents:

Unit 1: Laplace Transform Definition – conditions for existence ; Transforms of elementary functions ; Properties of Laplace transforms - Linearity property, first shifting property, second shifting property, transforms of functions multiplied by t^n, scale change property, transforms of functions divided by t, transforms of derivatives ; Evaluation of integrals by using Laplace transform ; Transforms	[8]

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of some special functions- periodic function, Heaviside-unit step function, Dirac delta function.	
Unit 2: Inverse Laplace Transform Introductory remarks ; Inverse transforms of some elementary functions ; General methods of finding inverse transforms ; Partial fraction method and Convolution Theorem for finding inverse Laplace transforms ; Applications to find the solutions of linear differential equations	[7]
Unit 3: Fourier series & Fourier Transforms Definition, Euler's formulae, Conditions for a Fourier expansion, Functionshaving points of discontinuity, change of interval, expansions of odd andeven periodic functions and half range series. Fourier Transforms, Fourier Sine and Cosine Transforms, Complex form ofFourier Integral, Finite Fourier Sine and Cosine Transform.	[7]
Unit 4: Z Transform Definition, properties of z transform, Z Transform of basic sequences, Z transform of some standard discrete function inverse Z transform.	[6]
Unit 5:Numerical solution of transcendental & algebraic equations & Numerical Integration Solution of Algebraic and Transcendental Equation: Bisection method, Method of false position, Newton's method and Newton-Raphson method. Trapezoidal rule, Simpson's (1/3) th rule, Simpson's (3/8) th rule and Weddle's rule (without proof).Problems.	[8]
Unit 6:Interpolation Finite differences: Interpolation/extrapolation using Newton's forward and backward difference formulae, Newton's divided difference and Lagrange's formulae (All formulae without proof).	[6]
Text Books: 1. P. N. Wartikar & J. N. Wartikar, A Text Book of Applied Mathematics (Vol I & II), Pune Vidyarthi Griha Prakashan, Pune. 2. N. P. Bali, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi.	
Reference Books: 1. C. R. Wylie & L. C. Barrett, Advanced Engineering Mathematics, McGraw-Hill Publishing Company Ltd. 2. B. V. Ramana, Higher Engineering Mathematics, McGraw-Hill Publications, New Delhi. 3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.	

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4. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.

5. Peter O" Neil, A Text Book of Engineering Mathematics, Thomson Asia Pvt. Ltd., Singapore

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Analog Electronics

EC302	PCC	Analog Electronics	3-0-0	3-Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electronics

Course Outcomes: At the end of the course, students will be able to:

CO1	Describe regulated power supply with classification.
CO2	Explain working of JFET with applications.
CO3	Explain working of MOSFET with applications.
CO4	Analyze different feedback amplifier configurations.
CO5	Illustrate different oscillator circuits.
CO6	Describe various multivibrator circuits

Course Contents:

Unit 1: Regulated Power Supplies: Need of voltage regulator and Classification. Discrete Regulators-Analysis and Design of Zener Shunt Regulator, Transistor Shunt Regulator, Emitter Follower Regulator, Series Pass Regulator(with Pre- regulator & Overload protection circuit). Study and design of regulators using IC's:78XX, 79XX, 723, LM317, Switching regulator: Introduction, study of LM3524	[6]
Unit 2: BJT Overview: Physical structure, Transistor currents: JFET: Introduction to JFET, Types, Construction, Operation, Static Characteristics, Pinch off voltage, FET Volt-Ampere characteristics, FET Configurations (CS/CD/CG) and their Comparison. Biasing of FET (Self).FET as an amplifier and its analysis (CS) and its frequency response, Small signal model, FET as High Impedance circuits.	[6]
Unit 3: MOSFET& its DC Analysis:	[6]

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Basics of MOS Transistor operation. Construction of n-channel E-MOSFET, E-MOSFET characteristics & parameters, non-ideal voltage current characteristics viz. Finite output resistance, body effect, sub-threshold conduction, breakdown effects and temperature effects. Common source circuit, Load Line & Modes of operation, common MOSFET configurations: DC Analysis	
Unit 4: Electronics Amplifiers: Classification of amplifiers, Fundamentals of Low noise and Power amplifiers. Feedback amplifiers: Feedback concept and topologies, Effect of feedback on terminal characteristics of amplifiers, feedback amplifier analysis, cascade amplifiers, DC Amplifiers.	[6]
Unit 5: Oscillators: Barkhausen criterion, stability with feedback. Classification of oscillators, RC Oscillators: FET RC Phase Shift oscillator, Wein bridge oscillator, LC Oscillators: Hartley and Colpitts oscillators, Crystal oscillators, UJT Relaxation oscillator.	[6]
Unit 6: Multivibrators: IC555 Block diagram. Types of Multivibrators: Astable, Monostable and Bistable, Operation of Multivibrators using FETs and IC555. Applications of IC555 in Engineering.	[6]

Text Books:

1. Millman Halkias, "Integrated Electronics-Analog and Digital Circuits and Systems", Tata McGraw Hill, 2000.
2. Donald Neaman, "Electronic Circuit Analysis and Design", 3rd Edition, Tata McGraw Hill.

Reference Books:

1. David A. Bell, "ElectronicDevicesandCircuits",5thEdition, Oxford press
2. R. L. Boylstad, L. Nashlesky, "Electronic Devices and circuits Theory", 9thEdition, Prentice Hall of India, 2006.
3. Anil K. Maini and Varsha Agarwal "Electronic Devices and Circuits", Wiley India
4. Phillip E. Allen, Douglas R. Holberg, "CMOS Analog Circuit Design", Second Edition, Oxford. K. R. Botkar, "Integrated Circuits", 5th Edition, Khanna Publication

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Digital Logic Design

EC303	PCC	Digital Logic Design	3-0-0	3 Credits

Teaching Scheme	Examination Scheme
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electronics

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply Boolean laws/k map method to reduce given Boolean function.
CO2	Design combinational logic circuits like adder, subtractor, multiplexer.
CO3	Interpret about semiconductor memories & PLD's.
CO4	Implement sequential logic circuits like Flip flop.
CO5	Apply Flip flops to design shift registers, counters and FSM models to design to building blocks likes sequence detector.
CO6	Explain basic of VHDL & make use of Simulation tool (ISE).

Course Contents:

Unit 1: Fundamentals of Digital Electronics: Arithmetic of Number Systems-Binary, Octal, Hex & BCD, Introduction of Boolean algebra, Concept of Min terms-Max terms, SOP-POS forms, Reduction Techniques, K-Map, K-map with Don't Care Condition, and Introduction to Codes.	[6]
Unit 2: Design of Combinational Circuits: Design Combinational Logic : Adder, look ahead carry generator, Sub Tractor, Sub tractor using 1's complement & 2's Complement, BCD Adder, Magnitude Comparator, Parity generators/checkers, Code converters, Design of Multiplexers and Demultiplexers, Encoders, Decoders, BCD - to - 7 segment decoder.	[6]

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Unit 3: Introduction of Digital Logic Families: Classification of Logic Families ,Characteristics of TTL & CMOS Logic families & comparison of TTL & CMOS logic families, CMOS inverter, static & dynamic characteristics, NAND & NOR gates. Study of Semiconductor Memories: RAM ROM, EPROM, and PAL & PLA.	[6]
Unit 4: Sequential Logic Circuits: 1-bit memory cell, latches and Flip-Flops (S-R, D, J-K &T), Use of preset and clear inputs, Excitation table for Flip-Flops, Conversion of Flip-Flops.	[6]
Unit 5: Applications of Flip Flops and Finite State Machines: Application of Flip flop: Shift Registers, Counters- Ripple counters, Synchronous Counters, Ring Counters, and Johnson Counter. FSM, Moore/Mealy machines, state diagram, state table, state assignment, state reduction, sequence detector.	[6]
Unit 6: Introduction to VHDL: Levels of abstraction, Digital system design flow, HDL's, Type of modeling - Structural and behavioral and data flow, difference between VHDL & Verilog.	[6]
Text Books: 1. Fundamentals of Digital Circuits, A. Anand Kumar, PHI, 3rd, 2008 2. Digital Design, M. Morris Mano, PHI, 3rd, 2008 3. Principles of DSE using VHDL, Roth John, Cengage, 2nd, 2008 4. Modern Digital Electronics, R.P. Jain, Tata McGraw Hill, 3rd, 2011 5. Fundamentals of Digital Logic with VHDL Design, Stephan Brown , Zvonko Vranesic, TMH, 2nd, 2009	
Reference Books: 1. Digital Design Principles, Wakerly, Pearson, 4th, 2006. 2. Digital Design, Leach,Malvino, TMH, 4th, 2011. 3. Digital Integrated Circuits-A Design Perspective, Jan Rabey, Anantha C, PHI, 2nd, 2009.	

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Operating System

EC304	PCC	Operating System	3-0-0	3 Credit

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: None

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the basic concept of operating system & their types.
CO2	Illustrate the flow of process with its states and different process scheduling policies.
CO3	Explain concepts of Mutual exclusion and IPC
CO4	Make use the concept of deadlocks
CO5	Illustrate concept of memory management policies.
CO6	Illustrate the concepts of Unix and Linux OS.

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Course Contents:

Unit 1: Introduction Basics of Operating System: Computer-System Organization, Computer-System Architecture, Definition of Operating system, Types of OS, OS Service, System Call, OS Structure : Layered, Monolithic, Microkernel OS, Concept of Virtual machine	[5]
Unit 2: Process Management Process Definition, Process States, Process Control Block, Context Switching, Threads-Concept of multithreads, Benefits of threads Process Scheduling: Definition, scheduling objective, Types of Scheduler, Scheduling Criteria(CPU Utilization, Throughput, Turnaround time, waiting time, Response time Definition only), Preemptive and Non Preemptive, Scheduling Algorithm: FCFS, SJF, RR	[8]
Unit 3:Interprocess communication Race condition, Critical Section, Mutual Exclusion, Hardware Solution, Peterson's Solution, Semaphore, Monitors, Message Passing, Classical IPC Problems.	[4]
Unit 4: Deadlock Definition, Deadlock Characterization, Deadlock Prevention, Deadlock Avoidance: Bankers algorithm, Deadlock detection and recovery	[5]
Unit 5: Memory Management Basic: Definition, Logical and Physical address map , Memory allocation: Contiguous memory allocation-Fixed and Variable partition- Internal and external fragmentation and compaction, Paging, Disadvantages of Paging, Segmentation concept only. Virtual Memory: Basics of Virtual memory, Page fault, Dirty Page, demand Paging, Page replacement policies.	[8]
Unit 6: Storage Management Overview of Mass-Storage Structure, Disk Structure ,Disk Attachment, Disk Scheduling, Disk Management File System: file Concept, Access Methods, Directory and Disk Structure	[6]

Text Books:

1. Operating system Concepts – Silberschatz Galvin
2. William Stallings, Operating System: Internal and Design Principles, Prentice Hall, ISBN-10:0-13-380591-3, ISBN-13:978-0-13-380591-8, 8th Edition

Reference Books:

1. Operating Systems – Madnick Domnovan (MGH)
2. Operating system-K.S.Sumitradevi,N.P.Banashree (SPD Publication)
3. Operating Systems concepts – James Peter.
4. Operating Systems Design and Implementation – Tanenbaum (PHI)

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Data Structure using C

EC305	PCC	Data Structure using C	3-0-0	3Credit

Teaching scheme:	**Examination scheme:**
Lecture: 3 hrs/week	CA-I:10 Marks CA-II: 10 Marks Mid Semester Exam: 30Marks End Semester Exam: 50 Marks

Pre-Requisites: - Basics of C programming.

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand the basics of data structure and its application.
CO2	Understand concepts of array and records.
CO3	Demonstrate the concepts of Linked List and apply various operations on them.
CO4	Understand concepts of stack and queue.
CO5	Demonstrate the concepts of Trees apply various operations on them.
CO6	Demonstrate Basic terminologies and representation of Graph.

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Course Contents:

UNIT-1: Introduction & Overview Introduction to data structures & its data types, Operations, Algorithms: complexity, time space trade-off with example.	[3]
UNIT-2: Arrays, Records Introduction, linear arrays, representation of linear array in memory, traversing linear arrays, inserting & deleting, Sorting: bubble sort, searching: linear search, binary search, Multidimensional arrays Records: Record structures, representation of records in memory, parallel arrays, matrices, sparce matrices.	[5]
UNIT 3 Linked Lists: Introduction, linked lists & its representation, Traversing & searching a linked list, memory allocation, Garbage collection, insertion & deletion of nodes of linked list, header linked list, two-way lists.	[6]
UNIT 4 Stacks & Queues: Introduction to stacks, stack as an Abstract Data type, representation through Arrays & linked lists, Applications of stacks , stacks & recursion; Queue as an abstract data type representation, circular, double ended, priority, Quicksort ,application of queues.	[5]
UNIT 5 Trees: Binary Tree: introduction, types, definition, properties, representations, operations, binary tree traversal, Header nodes; Threads, BST, Advanced trees : AVL trees or height balanced trees, representation operation, Expression trees. Multiway trees: trees, multiway search trees, B trees, Heaps, construction of a Heap.	[6]
UNIT-6 Graph: Introduction, Graph theory terminology, sequential representation of graphs: Adjacency Matrix, Path matrix, Warshall's Algorithm, shortest paths, linked representation. Operations, Traversing, Posets, Topological sorting.	[5]

Text Books:

1. S. Lipschutz, Data Structures, McGraw-Hill Publication, Revised Edition.
2. Thomas Cormen, Introduction to Algorithms, PHI Publication, 2nd Edition, 2002.
3. E. Horowitz, S. Sahani, Fundamentals of Data Structures, Galgotia Publication, 1st Edition, 1983.

Reference Books:

1. Kyle Loudon, Mastering Algorithms with C: Useful Techniques from Sorting to Encryption, O'Reilly Media, 1st Edition, 1999
2. Mark Allen Weiss, Data structures and algorithms analysis in C++, Pearson Education, 4thEdition, 2013.

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3. Y. Langsm, M. Augenstin, A. Tanenbaum, Data Structure using C and C++, Prentice-Hall India Learning Private Limited, 2nd Edition, 1998.
4. Trembley and Sorenson, Introduction to Data Structures, PHI Publication, 2nd Revised Edition, 1983.

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Analog Electronics Laboratory

EC306	PCC	Analog Electronics laboratory	0-0-2	1 Credit

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs./week	CA-I:15 Marks CA-II: 15 Marks End Semester Exam-20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Demonstrate common source amplifier circuit & test the performance.
CO2	Illustrate LC oscillator & MOSFET as inverter.
CO3	Design voltage regulator & multivibrator circuits.

List of Experiments:

Sr.No.	Title of Experiment
1.	Design a single stage FET Amplifier in CS configuration and verify DC operating point
2.	Build and test single stage CS amplifier using FET.
3.	Simulate frequency response of single stage common source amplifier and find bandwidth.
4.	Simulate Voltage series feedback amplifier
5.	Implement LC oscillator using FET
6.	Simulate MOSFET Inverter.
7.	Design and implement an adjustable voltage regulator using three terminal voltage regulators.
8.	To design and study the monostable multivibrator circuit using 555 timer.
9.	To design and study the astable multivibrator circuit using 555 timer.

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Digital Logic Design Laboratory

EC307	PCC	Digital Logic Design Laboratory	0-0-2	1 Credits

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs./week	CA-I:15 Marks CA-II: 15 Marks End Semester Exam-20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Demonstrate logic functions using universal gates & various combinational circuits.
CO2	Design & verify sequential logic circuits.

List of Experiments:

Sr. No	Name of the Experiments
1.	Study and Verify the truth table of the Basic Logic Gates.
2.	Study and Verify of NAND and NOR as a Universal Gates.
3.	Study and Verify the Demorgan's Theorem
4.	Study and Verify of Half Adder and Full Adder
5.	Study and Verify of Half Subs tractor and Full Subs tractor
6.	To Design and Implement 4-Bit Binary to Gray and Gray to Binary
7.	Study and Verify of 4_bit Adder[IC 7483]
8.	Study and Verify of 7485 magnitude comparator
9.	Study and Verify of MUX /DEMUX using 74151 and 74138
10.	Study and Verify of Flip Flop JK ,D and T.
11.	Study and Verify of asynchronous counter
12.	Study and Verify of Shift Register
13.	Write, Simulate & Verify VHDL Code for Verify the truth table of the Basic Logic Gates.

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Data structure using C Laboratory

EC308	PCC	Data structure using C Laboratory	0-0-2	1 Credit

Teaching Scheme:	Examination Scheme:
Practical : 2 hr/Week	CA-I : 15 Marks CA-II :15 Marks End Semester Exam: 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop logic for insertion, deletion & display
CO2	Make use of an array for searching & sorting.
CO3	Construct linked list, stack & queue.

List of Experiments:

Sr. No	Name of the Experiments
1.	Program to insert an element into an array.
2.	Program to delete an element from an array.
3.	Program to sort the array using bubble sorting.
4.	Program to search a number in an array using linear search.
5.	Program to search a number in an array using binary search.
6.	Program to perform operations on 2-D array.
7.	Program to insert node into linked list.
8.	Program to delete the node from linked list.
9.	Program to perform PUSH & POP operation on the stack.
10.	Program to perform queue operation.

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Environmental Sciences

MDC02	MC	Environmental Sciences	2-0-0	Audit

Teaching Scheme:	Examination Scheme:
Lecture:2hrs./week	CA I :25 Marks
Tutorial: NA	CA II : 25 Marks

Pre-Requisites: NA

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain various natural resources and associated Problems
CO2	Summarize various cosystems
CO3	Explain the importance of conservation of biodiversity and its importance in balancing the earth.
CO4	Recognizevariouscausesofenvironmentalpollutionalongwithvariousprotectionactsi nIndia to limit the pollution
CO5	Extract the information based of field study and prepare areport.

Course Contents:

Unit1:Natureof Environmental Studies: Definition, scope and importance. Multidisciplinary nature of environmental studies. Need for public awareness.	[2]

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Unit2:Natural Resources and Associated Problems: a) Forest resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. e)Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification. f) Role of individuals in conservation of natural resources	[6]
Unit3:Ecosystems: Concept of an eco-system. Structure and function of an ecosystem. Producers, consumers and de composers. Energy flow in the eco system. Ecological succession. Food chain etc. in concern with forest ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with Grass land ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with Desert ecosystem, Producers, consumers and decomposers. Energy flow in the ecosystem. Ecological succession. Food chain etc. in concern with various aquatic ecosystems	[4]
Unit4:Biodiversity: Introduction- Definition: genetic, species and ecosystem diversity. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Various approaches for the conservation of biodiversity.	[4]
Unit5:EnvironmentalPollutionandEnvironmentalProtection: Definition: Causes, effects and control measures of various types of pollution. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution, Concept of sustainable development: From Unsustainable to Sustainable development, Various environmental Protection Acts and their scope.	[4]

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Unit6:Field Work: The student should Visit to a local area to document environmental Assets-River/Forest/Grassland/Hill/Mountain. Or Visit to a local polluted site - Urban / Rural /Industrial /Agricultural. Or Study of common plants, insects, birds. or Study of simple ecosystems-ponds, river, hill slopes, etc. **The student should expect to do this activity in a group size of 4-5 and prepare and submit a report on it.**	**[4]**

Text/Reference Books:

1. Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner.
2. Bharucha Erach. The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad380013, India, Email: mapin@icenet.net
3. Brunner R.C.,1989,HazardousWaste Incineration, McGraw Hill Inc.480p

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Aptitude Skills-I

HMS01	HSMC	Aptitude Skills-I	1-0-0	1Credit

Teaching Scheme:	**Examination Scheme:**
Lecture:1hrs/week Tutorial: NA Practical: NA	CA-I:25Marks CA-II:25Marks

Pre-Requisites: Communication Skills

Course Outcomes: At the end of the course, students will be able to:

CO1	Understand speed math techniques to solve aptitude problems
CO2	Summarize number systems in detail.
CO3	Explain basic aptitude techniques related to Percentage, Average, Ratio Proportion and Fraction
CO4	Understand speed, time and distance concepts
CO5	Summarize the concepts of Business aptitude using basic aptitude
CO6	Solve the aptitude problems on Geometry and Venn Diagram

Unit1:SpeedMathTechniques Multiplication, Squares, Square roots, Cubes, Cube roots	[1]
Unit2:NumberSystem Types of Number System, Last Digit Method, BODMAS Calculation, HCFand LCM, Progressions	[2]
Unit3:Basic Aptitude Percentage, Average, Ratio and Proportion, Fraction, Partnership	[3]
Unit4:Speed-Time-Distance Speed, Time, and Distance, Trains, Boats, Streams, Races	[2]

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Unit 5:BusinessAptitude Profit & Loss, Simple Interest, Compound Interest	[2]
Unit 6: Geometry and Venn Diagram 2D and 3D Mensuration, Venn diagram	[2]

Text Books:

1. Arun Shrama- Quantitative aptitude for CAT.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S. ChandPublisher;2016 edition
3. RS Aggarwal, Quantitative Aptitude for Competitive Examinations, S. Chand Publisher;2016 edition

Reference Books:

1. Fast Track Objective Arithmetic Paperback, by Rajesh Verma– 2018
2. Teach Yourself Quantitative Aptitude, Arun Sharma
3. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar

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Language Skill-I

HMS02	**HSMC**	**Language Skills- I**	**0-0-2**	**Audit**

Teaching Scheme:	**Examination Scheme:**
Lecture: NA Tutorial: NA Practical:2hrs/week	CA-I:25Marks CA-II:25Marks

Pre-Requisites: Communication Skills

Languages (Any One)

C Programming (Technical Language)(24Hrs)

Syllabus for C Programming

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain fundamentals &essentials of C programming.
CO2	Illustrate Types, Operators and Expressions.
CO3	Make use of Decision Making and Looping Statements
CO4	Make use of Arrays in C programming.

Course Contents:

Unit1: Basics of C Editing, Compiling, Error Checking, executing, testing and debugging of Programs, Flowcharts, Algorithms, Structure of C Program.	**[6]**

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Unit2:Types, Operators and Expressions Variable names, Data types, sizes, constants, declarations, arithmetic operators,relationalandlogicaloperators,typeconversions,incrementanddecrementoperators,bitwise operators, assignment operators and expressions, conditional expressions precedence and order of evaluation	[6]
Unit3:Decision Making and Looping Statements Statements and Blocks. If-else, else-if switch Loops while and for, do-while break And continue goto and Labels.	[6]
Unit4: Arrays Initializing arrays, Initializing character arrays, two dimensional and multidimensional arrays.	[6]
Text Books 1. C Programming Absolute Beginner's Guide, Que Publishing; 3rdedition (22 August 2013) 2. C Programming Language 2nd Edition, Peasrson Publication	
Reference Books 1. C: The Complete Reference, McGraw Hill Education; 4th edition (1July2017) 2. C Programming in easy steps,5th Edition, In Easy Steps Limited 3. The C Programming Language, Second Edition, By Pearson Education India (1 January 2015)	

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Mini Project-II

PRJ02	PROJ	Mini Project-II	0-0-2	Audit

Teaching Scheme:	Examination Scheme:
Lecture:--NA Tutorial: --NA Practical: 2hr/week	CA-I: 25Marks CA-II: 25Marks

Course Outcomes: At the end of the course students will be able to

CO1	Develop software and Hardware skills.
CO2	Improve technical knowledge, Team Building, communication and management.

Instructions:

Students have to submit a report to the respective guide and demonstrate the mini project forth evaluation. Students have to carry out one mini project in a group of maximum four students.

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Teaching and Evaluation Scheme for SY B. Tech.

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Semester: IV

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Department: Electronics & Computer Engg. **Rev:** Course Structure/00/2021-22

Class: S.Y. B. Tech **Semester:** IV

Course Code	Course Type	Course	Teaching Scheme				Evaluation Scheme					Credits
			L	T	P	Total Hrs.	CA1	CA2	MSE	ESE	Total	
EC401	PCC	Analog & Digital Communication	3	-	-	3	10	10	30	50	100	3
EC402	PCC	Linear Integrated Circuits	3	-	-	3	10	10	30	50	100	3
EC403	BSC	Probability and statistics	4	-	-	4	10	10	30	50	100	4
EC404	PCC	Object Oriented programming paradigm	3	-	-	3	10	10	30	50	100	3
EC405	PEC	Elective -I	3	-	-	3	10	10	30	50	100	3
EC406	PCC	Analog & Digital Communication Laboratory	-	-	2	2	15	15	-	20	50	1
EC407	PCC	Linear Integrated Circuit Laboratory	-	-	2	2	15	15	-	20	50	1
EC408	PCC	Object oriented programming Laboratory	-	-	2	2	15	15	-	20	50	1
EC409	PCC	Measurement Laboratory	-	-	2	2	15	15	-	20	50	1
MDC01	MC	Constitution of India	1	-	-	1	25	25	-	-	50	Audit
HMS03	HSMC	Aptitude Skills – II	1	-	-	1	25	25	-	-	50	Audit
HMS04	HSMC	Language Skills – II	-	-	2	2	25	25	-	-	50	1
PRJ03	PROJ	Mini Project – III	-	-	2	2	25	25	-	-	50	1
IFT01	PROJ	Industrial Training / Field Training – I	-	-	-	-	25	25	-	-	50	Audit
		Total	**18**	**-**	**12**	**30**	**235**	**235**	**150**	**330**	**950**	**22**

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Analog and Digital Communication

EC 401	PCC	Analog and Digital communication	3-0-0	3 Credits

Teaching scheme:	**Examination Scheme:**
Lecture:3hrs/week	CA1 :10 Marks CA2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: - Fundamental electronics & Fundamental Mathematics

CO1	Explain the basic concepts of the analog communication systems.
CO2	Determine modulation index, bandwidth and power requirements for various amplitude modulation schemes.
CO3	Analyze frequency modulation schemes and compare AM, FM, and PM
CO4	Make use of detection methods to perform amplitude and frequency demodulation
CO5	Elaborate different source coding techniques
CO6	Compare various carrier modulation techniques

Course Outcomes: At the end of the course, students will be able to:

Course Contents:

Unit 1: Introduction to Communication System Block schematic of analog communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Baseband and pass-band communication, Necessity of modulation, Classification of modulation, Sampling theorem, Pulse analog modulation-PAM, PWM, PPM, Introduction to multiplexing-TDM, FDM.	[06]
Unit 2: Amplitude Modulation Introduction, Mathematical analysis of AM, Modulation index, Frequency spectrum and bandwidth of AM, Power calculations, Generation of AM using nonlinear property, Low- and high-level modulation, Balance Modulator, Types of AM: DSB-FC, DSB- SC, SSB-SC, ISB and VSB, their generation methods and comparison.	[06]

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Unit 3: Angle Modulation Introduction, Mathematical analysis of FM and PM, Modulation index for FM and PM, Frequency spectrum and bandwidth of FM, Narrow band and wide band FM, Direct and indirect methods of FM generation, Pre emphasis and de-emphasis, Comparison of AM, FM and PM.	[06]
Unit 4: AM and FM Detectors AM Detectors: Envelop detector and practical diode detector, FM Detectors: Slope detector, phase discriminator and ratio detector	[06]
Unit 5: Source coding and Line coding Block schematic of digital communication system, Quantization, PCM, DPCM, DM, ADM, Line codes- Unipolar/Polar NRZ, RZ, Bipolar NRZ, Manchester	[06]
Unit 6: Digital Modulation schemes Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Binary Phase Shift Keying (BPSK), Differential Phase Shift Keying (DPSK), Quadrature Phase Shift Keying (QPSK), Quadrature Amplitude Modulation (QAM), Bandwidth, efficiency, and comparison of various carrier modulation techniques (ASK – FSK – PSK – QAM).	[06]

Text Books:

1. Kennedy, "Electronics Communications Systems", McGraw-Hill NewDelhi-1997, 4th Edition.
2. R. P. Singh, S. D. Sapre, "Communication Systems Analog and Digital", McGraw-Hill New Delhi, 2nd Edition.
3. Anokh Singh, "Principles of communication engineering" S. Chand
4. Wayne Tomasi, "Electronic Communication Systems", Pearson Education-2005, 5th Edition
5. K. Sam Shanmugam, "Digital& Analog Communication" (John Wiley)
6. Simon Haykin, "Digital Communication" (Wiley)

Reference Books:

1. Bernard Sklar, Pabitra Kumar Ray-'Digital Communications'-2nd Edition-Pearson
2. Taub- Schilling – Saha- 'Principals of communication systems' -3rd Edition-Mc GrawHill
3. Lathi B P & Ding Z –'Modern Digital & Analog Communication Systems'- Oxford University Press, Fourth Edition
4. Ha Nguyen Ed Shwedyk-A First Course in Digital Communication – Cambridge Unipress
5. Roddy & Coolen, "Electronic communication" PHI
6. Beasley & Miller, "Modern Electronic Communication", Prentice-Hall India-2006, 8th Edition.

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Linear Integrated Circuits

EC402	PCC	Linear Integrated Circuits	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	CA1 :10 Marks CA2 :10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Basic Electronics & Analog Circuit

Course Outcomes: At the end of the course, students will be able to:

CO1	Explain the characteristics of IC & op-amp parameters
CO2	Design linear and Nonlinear applications using op-amp
CO3	Compare different active filters using op-amp
CO4	Make use of op-amp to test various oscillators using op-amp
CO5	Make use of IC 555 and design multivibrators
CO6	Relate and implement different converters using op-amp

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Course Contents:

Unit 1 Introduction to op-amp Block diagram of OP-AMP, Explanations of each block, Differential Amplifier configurations, Differential amplifier analysis (AC & DC) for dual-input balanced-output configuration using 'r' parameters, level shifter, current mirror circuits, and Op-Amp parameters. OP-AMP configurations, Study of op-amp Data Sheets	[6]
Unit 2 Applications of op-amp Summing, Scaling & Averaging Amplifiers using Op-amps, Differential amplifier using op-amp, Subtractor Circuit, Instrumentation amplifier, Precision Rectifiers, Comparators, Schmitt Trigger, Clippers & Clampers, and Peak Detectors.	[6]
Unit 3 Active Filters Introduction, Analysis & Design of Butterworth filters: High Pass filter, Low Pass filter (First & Second order), Band Pass filter, Band Reject filter, All Pass Filter, Introduction to Chebyshev Filter.	[6]
Unit 4 Waveform Generators Analysis & Design of Square wave generator, Triangular wave generator, Sawtooth wave generator. Analysis & Design of RC phase shift oscillator, RC wein-bridge oscillator, Colpitts oscillator, Hartley oscillator.	[6]
Unit 5 Special purpose ICs IC 555 Timer: Block Diagram, Operating Principle, Multi-vibrator using IC 555. IC 565 PLL: Operating Principles, applications, Introduction of (block diagram, features, and application areas): IC OP177 op-amp,	[6]
Unit 6 System Design Using Op-amp Analog to digital Converter, Digital to analog Converter, V to I & I to V Converter, voltage to frequency converter, On off controller, proportional controller, PID Controller	[6]
Text Books: 1. Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", Pearson Education second and latest edition	
Reference Books: 1. Robert Coughlin, Fredric Driscoll, "Operational Amplifiers and Linear Integrated Circuits", Sixth edition, PE, 2006. 2. David Bell, "Operational Amplifiers and Linear ICs", Third edition, Oxford University Press \ 3. B. Somanathan Nair, "Linear Integrated Circuits- Analysis, Design & Applications", Wiley India. 4. T.R Ganesh Babu, "Linear Integrated Circuits" 3rd Edition, Scitech Publication	

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5. David. A. John & Ken Martin "Analog Integrated Circuit Design", Student Edition, Wiley
6. Sergio Franco "Design with op-amp & Analog Integrated Circuits" , 3rd Edition, Tata McGraw Hill.
7. Sergio Franco "Design with op-amp & Analog Integrated Circuits", 3rd Edition, Tata McGraw Hill.
8. S. Salivahanan & Bhaaskaran "Linear Integrated Circuits", 1st Edition, Tata McGraw Hill.

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Probability and Statistics

EC403	BSC	Probability and Statistics	4-0-0	4 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 4 hrs/week	CA1:10Marks CA2:10Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: HSC Mathematics

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply the concepts of probability to solve engineering problems.
CO2	Illustrate and formulate fundamental probability distribution and density functions, as well as functions of random variable.
CO3	Apply different methods to find the correlation between the variable.
CO4	Develop basic mathematical tools for regression analysis.
CO5	Develop basic mathematical tools for fitting of curves like linear and non-linear curve.
CO6	Develop basic mathematical tools for Queening theory.

Course Contents:

Unit 1: Basic Probability Definition and concept of probability: Addition theorem of probability Multiplication theorem of probability (Without proofs), Examples. Random variables, Probability distributions, Probability mass function, Probability density function, Mathematical expectation, Join and marginal probability distributions, Properties of expectation and variance with proofs.	[7]
Unit 2: Theoretical Probability Distributions Binomial distribution, Poisson distribution, Normal distribution, Fitting of binomial distributions, Properties of binomial, Poisson and normal distributions, Relation between binomial and normal distributions, Relation between Poisson and normal distributions, Importance of normal distribution, Examples.	[7]

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Unit 3: Correlation Introduction, Types of correlation, Correlation and causation, Methods of studying correlation, Karl Pearson's correlation coefficient, Spearman's rank correlation, Coefficient, Properties of Karl Pearson's correlation coefficient and Spearman's rank correlation coefficient, Probable errors.	[5]
Unit 4: Linear Regression Analysis Introduction, Linear and non-linear regression, Lines of regression, Derivation of regression lines of y on x and x on y, Coefficients of regression, Properties of regression coefficient.	[5]
Unit 5: Applied Statistics Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and Exponential curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.	[6]
Unit 6: Queuing Theory Introduction, Queuing systems, The input or arrival pattern, The service pattern and service discipline, Notation, Performance measures, Little's formula, Relation between the probabilities of states, M/M/1/∞ systems, Examples.	[6]

Text Books:

1. G. V. Kumbhojkar, Probability and Random Processes, C. Jamnadas and Co., 14th Edition, 2010.
2. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

Reference Books:

1. Kishor S. Trivedi, Probability, Statistics with Reliability, Queuing and Computer Science Applications, Wiley India Pvt. Ltd, 2nd Edition, 2001.
2. Vijay K. Rohatgi, A. K. Md. Ehsanes Saleh, An Introduction to Probability and Statistics, Wiley Publication, 2nd Edition, 2001.
3. S. C. Gupta, Fundamentals of Statistics, Himalaya Publishing House, 7th Revied and Enlarged Edition, 2016.
4. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
5. G. Haribaskaran, Probability, Queuing Theory and Reliability Engineering, Laxmi Publications, 2nd Edition, 2009.
6. Murray Spiegel, John Schiller, R. ALU Srinivasan, Probability and Statistics, Schaum's Outlines, 4th Edition, 2013.

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Object oriented programming paradigm

EC404	PCC	Object oriented programming paradigm	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	CA1:10 Marks CA2:10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: C Language.

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop C++ programs to solve problems using Procedure Oriented Approach.
CO2	Develop C++ programs using classes and objects
CO3	Implement Inheritance in C++ program
CO4	Make Use of Pointer in C++ program
CO5	Make Use of Polymorphism C++ program
CO6	Develop C + + programs to perform file operations.

Course Contents:

Unit 1: Introduction to OOP and POP POP vs. OOP, Basic Concepts of OOP, OOP Languages, Applications of OOP, C vs C++, Structure of C++, Simple C++ Program. Tokens, Keywords, variables, constants, basic data types, type casting, user defines data types, typecasting, operators, expressions. Control structure: decision making statements and Loops, Scope resolution operator, memory management operators, arrays, strings and structures in C++	[7]

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Unit 2:Classes and Objects Specifying a class, Access Specifies, defining member functions, creating objects, memory allocations for objects, Static data member and static member function, Friend Function Array of objects, Object as a Function arguments, Concept of Constructor, Types of Constructors- Multiple Constructors in a Class ,Constructor with default arguments Destructors	[7]
Unit 3: Inheritance Introduction to Inheritance, Defining a Derived Class, Visibility modes and effects, Types of Inheritance: Single, Types of Inheritance: Multilevel, Types of Inheritance: Multiple, Types of Inheritance: Hierarchical, Types of Inheritance: Hybrid3.9 Virtual Base Class, Abstract Class , Constructor in Derived Class.	[7]
Unit 4: Pointer Concept of Pointer: Pointer Declaration, Pointer Operator, Address Operator, Pointer Arithmetic. Pointer to Object: Pointer to Object, this pointer, Pointer to derived class.	[4]
Unit 5: Polymorphism Introduction To polymorphism, Types of polymorphism, Compile time polymorphism: Function Overloading, Operator Overloading, Overloading Unary and Binary Operators, Rules of Operator Overloading, Run time Polymorphism: Virtual Functions, Rules for virtual functions, pure virtual functions.	[4]
Unit 6: File handling C++Stream Classes, Classes for file stream operations, Opening Files, Closing Files, Reading from and writing to files, Detection of EOF, File Modes	[7]
Text Books/ Reference Books: 1. Object Oriented Programming with C++" by Balagurusamy. 2. Object-Oriented Programming in C++" by Rajesh K Shukla. 3. Object Oriented Programming in C++" by Robert Lafore. 4. Accelerated C++: Practical Programming by Example by Andrew Koenig and Barbara E. 5. Stroustrup: The C++ Programming Language (4th Edition) C++ Primer (5th Edition) 5th Edition by Stanley B. Lippman, Josée Lajoie, and Barbara E. Moo	

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ELECTIVE -I

1. Transducers and Measurement.
2. Network Theory
3. Object Orientated Analysis and Modelling.

Transducers and Measurements

EC405A	PEC	Transducers & Measurements	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture:3 hrs/week	CA1:10 Marks CA2:10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites:

Course Outcomes: At the end of the course, students will be able to:

CO1	Select appropriate transducer as per requirement of application
CO2	Classify different data acquisition system
CO3	Interpret about various instrumentation systems
CO4	Choose proper instrument to measure different electrical parameters
CO5	Explain functions of display devices
CO6	Analyze different Bridges

Course Contents:

Unit 1: Transducers & Sensors: Definition, Classification of Transducers, Selection Factors and General Applications of Transducers, Transducers:- (i) Motion, (ii) Flow, (iii) Pressure, (iv) Temperature, (v) Force and Torque, (vi) Sound Transducer, Hall Effect Transducers, Digital Transducers, Proximity Sensors, Piezo – electric sensors.	[6]
Unit 2: Signal Conditioning & Data Acquisition System: Introduction, AC & DC Signal Conditioning, Chopper Stabilized Amplifier, Instrumentation Amplifier, Isolation and Programmable Gain Amplifier, Grounding and Shielding, Concept of Active Filters, Practical Comparators, Modulators, Demodulators, Sine And Other Waveform Generation, Principles and working of different types of ADC and DAC.	[6]

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Unit 3: Instrumentation Techniques: Introduction to Process Instrumentation, Instrumentation set up for measurement of nonelectrical quantity such as weight using strain gauge.	[6]
Unit 4: Introduction to Measurement: Introduction, Performance Characteristics, Static Characteristics, Error in Measurement, Types of Static Error, Sources of Error, Dynamic Characteristics, Statistical Analysis, Electrical Standards, Atomic Frequency and Time Standards, Graphical Representation of Measurements as a Distribution, Digital voltmeters- Introduction, Types of DVM, general specifications of DVM, digital multimeter, digital measurements of time, digital frequency meter, Q meter, Instrument calibration.	[6]
Unit 5: Measurement & Display Devices: CRO: Dual Beam, Dual Trace, sampling, Digital storage, Measurement of phase and frequency using Lissajous pattern, CRO probes: active, passive, current, attenuators, LED, LCD, Graphics Display, Signal Generators, Function generators. Spectrum analyzer, logic analyzer.	[6]
Unit 6: Bridges: Measurement of Resistance with Bridges, Wheatstone's Bridge, Kelvin Double Bridge, AC Bridges such as Haye's Bridge, Wein Bridge, Maxwell's-Wein Bridge, Maxwell' L/C Bridge, Schering Bridge.	[6]
Text Books: 1. A course in Electrical, Electronics measurement and Instrumentation, A.K.Sawhney 2. Electronic Instrumentation, H. S. Kalsi, MGH, 3rd Edition	
Reference Books: 1. Electronic Instrumentation and Measurement Techniques, Welfrick Cooper. 2. Instrumentation for Engineers and Scientists, John Turner, II Edition, Wiley 3. Electronic Instrumentation and Measurements, David A Bell, Third Edition, Oxford 4. Instrumentation for Engineering Measurements, James W Dally, II Edition, Wiley	

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Network Theory

EC405B	PEC	Network Theory	3-0-0	3Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	CA1:10 Marks CA2:10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: Physics

Course Outcomes: At the end of the course, students will be able to:

CO1	Classify network elements & apply mesh & node analysis.
CO2	Make use of network theorems to analysis linear circuits.
CO3	Determine two port network parameters & interrelation between parameters.
CO4	Explain the concept of series and parallel resonance and define selectivity, bandwidth & quality factor.
CO5	Apply Laplace to solve the networks.
CO6	Design and analysis different filters.

Course Contents:

Unit 1: Basic Concepts: Basic Electrical Elements, Classification of Network Elements, Energy and Power in Network elements, Mesh and Node Analysis: Loop and Node Analysis with Dependent and independent sources, Super Mesh and Super Node Analysis.	[6]
Unit 2: Network Theorems: Maximum Power Transfer Theorem, Principle of Dual Networks, Analysis of Networks using Superposition theorem, Reciprocity Theorem, Thevenin's Theorem, Norton's, Theorem.	[6]
Unit 3: Two port network: Two port networks (z, y) Two port networks parameters, interrelationship between parameters, cascade connection of two port networks.	[6]

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Unit 4: Resonance: Definition, Types: series & parallel resonance. Series resonance- resonant frequency, variation of impedance, admittance, current & voltage across L & C with respect to frequency, Effect of resistance on frequency response, Selectivity, B.W. & Quality factor. Parallel resonance – Anti resonance frequency, variation of impedance & admittance with frequency, Selectivity & B.W.	[6]
Unit 5: Transient Analysis in Networks: Behaviour of R, L & C components under switching conditions in time domain, initial & final value theorem, step and ramp response of RLC circuit, solution of a network using Laplace transform.	[6]
Unit 6: Filters: Definitions, classification & characteristics of different filters, filter fundamental such as attenuation constant, phase shift, propagation constant, characteristic impedance, decibel, neper. Design & analysis of constant K, M derived & composite filters (low pass, high pass, band pass & band stop filters): T & Pi sections.	[6]
Text Books: 1. A. Sudhakar, Shyammohan S.Palli 'Circuit & Network – Analysis & Synthesis' IIIrd Edition – Tata McGraw Hill Publication (Unit II,IV,V) 2. A.Chakrabarti 'Circuit Theory (Analysis & Synthesis)' - IIIrd Edition (Unit I,II) Dhanpat Rai & co 3. D. Roy Choudhury 'Networks & Systems' - New Age International Publisher (Unit I, II ,III) 4. Soni Gupta 'Electrical Circuit Analysis' Dhanpat Rai & Co. (Unit III, IV ,V,VI)	
Reference Books: 1. William H Hayt, Jack E Kimmerly and Steven M.Durbin, Engineering Circuit Analysis, Tata McGraw Hill 2. M.E.Van Valkenburg ' Network Analysis' – IIIrd Edition , Pearson Education / PHI 3. Josheph Edministrar 'Theory & Problems of Electronic Circuit (Schaum's series) – Tata McGraw Hill, Publication 4. R. G.Kaduskar, S.O.Rajankar, T.S. Khatavkar, Network Fundamentals and Analysis – Wiley India.	

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Object Oriented Analysis and Modelling

EC405C	PEC	Object Oriented Analysis and Modelling	3-0-0	3 Credits

Teaching Scheme:	**Examination Scheme:**
Lecture: 3 hrs/week	CA1:10 Marks CA2:10 Marks Mid Semester Exam: 30 Marks End Semester Exam: 50 Marks

Pre-Requisites: C Language.

Course Outcomes: At the end of the course, students will be able to:

CO1	Build use case diagrams using uml diagrams.
CO2	Develop class diagrams.
CO3	Construct dynamic diagrams.
CO4	Develop Design patterns using Designing objects.
CO5	Experiment with object oriented methodizes using SQA

Course Contents:

Unit 1: Unified Process and use Case Diagrams Introduction to OOAD with OO Basic, Unified Process, UML diagrams, Use Case,Case study , the Next Gen POS system, Inception -Use case Modelling , Relating Use cases include, extend and generalization , When to use Use-cases	[6]
Unit 2: Static UML Diagrams Class Diagram— Elaboration — Domain Model — Finding conceptual classes and description classes — Associations — Attributes — Domain model refinement — Finding conceptual class Hierarchies — Aggregation and Composition — Relationship between sequence diagrams and use cases — When to use Class Diagrams	[6]
Unit 3: Dynamic and Implementation UML Diagrams Dynamic Diagrams, UML interaction diagrams, System sequence diagram Collaboration diagram, when to use Communication Diagrams, State machine diagram and Modelling –	{6]

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When to use State Diagrams — Activity diagram — When to use activity diagrams Implementation Diagrams — UML package diagram — When to use package diagrams — Component and Deployment Diagrams — When to use Component and Deployment diagrams	
Unit 4: Design Patterns GRASP: Designing objects with responsibilities — Creator — Information expert — Low Coupling — High Cohesion — Controller Design Patterns — creational — factory method — structural — Bridge — Adapter — behavioural — Strategy — observer – Applying GoF design patterns — Mapping design to code	[9]
Unit 5: Testing Object Oriented Methodologies — Software Quality Assurance — Impact of object orientation on Testing — Develop Test Cases and Test Plans	[9]
Text Books/ Reference Books: 1. Practical Object-Oriented Design: An Agile Primer Using Ruby (2nd Edition)- Sandi Metz 2. Head First Object-Oriented Analysis and Design- Brett D. McLaughlin and Gary Pollice 3. Object-Oriented Analysis and Design with Applications (3rd Edition)- Grady Booch and Robert A. Maksimchuk 4. Object-Oriented Analysis, Design and Implementation: An Integrated Approach (Undergraduate Topics in Computer Science Brahma Dathan and Sarnath Ramnath	

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Analog and Digital Communication Laboratory

EC406	PCC	Analog and Digital Communication Laboratory	0-0-2	1 Credits

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs./week	CA1:15 Marks CA2:15 Marks End Semester Exam: 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Demonstrate generation and detection of analog and digital modulation techniques.
CO2	Illustrate sampling techniques.
CO3	Apply time division multiplexing concepts in pulse modulation system

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Experiment list: - Any 8 Experiments from given list.

Expt. No	Name of the Experiments
01	Amplitude modulation and Demodulation
02	Double sideband suppressed carrier (DSBSC) modulation and Demodulation
03	Single sideband (SSB) modulation and Demodulation
04	Frequency Modulation and Demodulation
05	Natural and Flat top sampling and its reconstruction
06	PWM modulation and Demodulation
07	PPM modulation and Demodulation
08	Amplitude Shift Keying: Generation and Detection
09	Frequency shift keying: Generation and Detection
10	Binary Phase Shift Keying (BPSK): Generation and Detection
11	Quadrature Shift Keying (QPSK): Generation and Detection

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Linear Integrated Circuits Laboratory

EC407	PCC	Linear Integrated Circuits Laboratory	0-0-2	1Credits

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs /Week	CA1:15 Marks CA2:15 Marks End Semester Exam: 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Select an appropriate op-amp for a particular application by referring data sheet.
CO2	Design, build & test linear & Non-linear circuits.
CO3	Design & analyze active filters waveform generators and converters using op-amp.

Experiment List: Minimum 10 Experiments from the given list.

Expt. No.	**Name of the Experiments**
01	Measure op-amp parameters and compare with the specifications. (a) Measure input bias current, input offset current and input offset voltage. (b) Measure slew rate (LM/UA741C and LF356) (c) Measure CMRR
02	Design of inverting, non-inverting amplifier & their frequency response.
03	Design of Summing, scaling, and averaging amplifier.
04	Design, build and test Comparator and Schmitt trigger.
05	Design, build and test precision half & full wave rectifier.
06	Design, build and test differentiator and integrator.
07	Design of Butterworth first order filters.
08	Design, build and test square & triangular wave generator.

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09	Design and implement Wien bridge oscillator using Op-Amp.
10	Design of a-stable & mono-stable multi-vibrators using IC555.
11	Design On Off Controller/proportional Controller.
12	Design of Voltage to current and current to voltage convertor.

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Object Oriented Programming Laboratory

EC408	PCC	**Object Oriented Programming Laboratory**	0-0-2	1 Credits

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs /Week	CA1:15Marks CA2:15Marks End Semester Exam: 20 Marks

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop C++ programs using functions, classes and objects.
CO2	Make Use of Pointer in C++ program.
CO3	Implement Inheritance in C++ program.

Experiment List:

Expt. No.	**Name of the Experiments**
01	To write a C++ program to find the sum of the given variables using function with default arguments.
02	To implement the concept of function with default arguments.
03	To write a C++ program to find the value of a number raised to its power using call by value.
04	To write a program in C++ to prepare a student Record using classes with primitive data members.
05	To write a program in C++ to display product detail using classes with array as data members.
06	Write a program in C++ to implement the classes with pointers as data members.
07	To write a C++ program to implement the concept of Function Overloading.
08	To implement single inheritance using c++.
09	To write a C++ program to implement the concept of Virtual functions
10	To write a C++ program for swapping two values using function templates

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Measurement Laboratory

EC409	PCC	Measurement Laboratory	0-0-2	1 Credit

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hr/Week	CA1:15Marks CA2:15Marks End Semester Exam: 20 Marks

Experiment List: Minimum 8 Experiments from the given list.

Expt.No.	**Name of the Experiments.**
01	To study the Characteristics of Strain gauge
02	To study the Characteristics of Temperature measurement (Thermistor/RTD/Thermocouple)
03	To study the Characteristics of LVDT
04	To study the position measurement using Synchro transmitter-receiver
05	To study of function generator
06	To study of CRO
07	To study the proximity sensors (Inductive and optical sensors)
08	To measurement of phase and frequency by Lissajous pattern using CRO
09	To study of AC Bridge
10	To study of DC Bridge

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Constitution of India

MDC01	MC	Constitution of India	1-0-0	Audit

Teaching Scheme:	**Examination Scheme:**
Lecture: - 1hr/week	CA1:25Marks CA2:25Marks

Pre-Requisites: Nil

Course Outcome: At the end of the course students will be able to

CO1	Define the meaning and features of Indian constitution.
CO2	Interpret right to life and fundamental rights to certain free document under article19 and 21.
CO3	Outline the federal structure of power and directive principles of state policy.

Course Contents:

Unit1: Meaning of the constitutional and constitutionalism, Historical perspective of the Constitution of India.	[2]
Unit2: Salient features and characteristics of the Constitution of India, Scheme of the fundamental rights, The scheme of the Fundamental Duties and its legal status	[2]
Unit3: The Directive Principles of State Policy – Its importance and implementation, Federal structure and distribution of legislative and financial powers between the Union and the States, Parliamentary Form of Government in India– The constitution powers and status of the President of India	[2]
Unit4: Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency	[2]

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Unit5: Local Self Government – Constitutional Scheme in India, Scheme of the Fundamental Right to Equality	[2]
Unit6: Scheme of the Fundamental Right to certain Freedom under Article 19, Scope of the Right to Life and PersonalLibertyunderArticle21.	[2]
Books: 1. Constitution of India Published by Government of India Ministry of Law and Justice (Legislative Department), 2020 2. Text book on The Constitution of India by S R Bhansali 3. Constitution of India by Bakshi P M, January2014	

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Aptitude Skills- II
(Numerical Ability)

HMS03	HSMC	Aptitude Skills- II	1-0-0	audit

Teaching Scheme:	**Examination Scheme:**
Lecture: 1hrs/week	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: English Communication

Course Outcomes: At the end of the course, students will be able to:

CO1	To make use of multiplications, squares, square roots, cubes and cube roots to solve aptitude problems.
CO2	To solve questions based on Number system.
CO3	To solve questions based on percentage, average, ratio and proportion.
CO4	To solve questions based on Time Speed and Distance.
CO5	To solve questions based on Profit & Loss.
CO6	To solve questions based on mensuration's.

Course Contents:

Unit 1: Speed Math Techniques Multiplication, Squares, Square roots, Cubes, Cube roots	[2]
Unit 2: Number System Types of Number System, Last Digit Method, BODMAS Calculation, HCF and LCM, Progressions	[2]
Unit 3: Basic Aptitude Percentage, Average, Ratio and Proportion, Fraction, Partnership	[2]
Unit 4: Speed- Time- Distance Speed, Time, and Distance, Trains, Boats, Streams, Races	[2]
Unit 5: Business Aptitude Profit & Loss, Simple Interest, Compound Interest	[2]
Unit 6: Geometry and Venn Diagram 2D and 3D Mensuration, Venn diagram	[2]
Text Books: 1. Arun Shrama - Quantitative aptitude for CAT. 2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S.Chand Publisher; 2016edition	

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Reference Books:

1. Fast Track Objective Arithmetic Paperback, by Rajesh Verma – 2018
2. Teach Yourself Quantitative Aptitude, Arun Sharma
3. The Pearson Guide to Quantitative Aptitude for Competitive Examination by Dinesh Khattar

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Aptitude Skills- II
(Verbal Ability)

HMS03	HSMC	Aptitude Skills- II	1-0-0	Audit

Teaching Scheme:	**Examination Scheme:**
Lecture: 1hrs/week	CA1: 25 Marks CA2: 25 Marks

Pre-Requisites: Basic Mathematics

Course Outcomes: At the end of the course, students will be able to:

CO1	Apply sentence formation rules to spot the error
CO2	Solve the questions based on the types of tenses
CO3	Solve the questions based on Direct/Indirect Speech and Passive/active voice
CO4	Solve the questions on Substitution and Elimination
CO5	Make use of Proverbs, Idioms and phrases in sentence construction
CO6	Solve the questions based on the vocabulary

Course Contents:

Unit 1 Structure and Types of Sentences, Conditional Sentences	[2]
Unit 2 Present tense, Past tense, Future tense, Use of Tenses in Sentence forming	[2]
Unit 3 Direct and Indirect Speech, Active and Passive Voice	[2]
Unit 4 Use of Modal verbs in Sentence Forming, Substitution and Elimination	[2]
Unit 5 Use of Proverbs, Idioms and Phrases in Sentence Construction, Judgment and Inference Sentence	[2]
Unit 6 Vocabulary Building in Various Situations.	[2]

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Text Books: 1.Raymond Murphy, Essential English Grammar with Answers, Murphy. 2.Objective General English by R.S. Aggarwal, S Chand Publishing;Revised edition (15 March 2017).	
Reference Books: 1.Rao and D.V. Prasada, Wren & Martin High School English Grammar and Composition Book, S. Chand Publishing, 2017. 2.Murphy, Intermediate English Grammar with Answers,Cambridge University Press; Second edition.	

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Language Skill- II

HMS04	HSMC	Language Skill- II	0-0-2	1 Credit

Teaching Scheme:	**Examination Scheme:**
Practical: 2 hrs/week	CA1: 25Marks CA2: 25Marks

Pre-Requisites: Language Skill I

Course Outcomes: At the end of the course, students will be able to:

CO1	Develop programs using Functions.
CO2	Make use of Structures & Union to develop programs in C language.
CO3	Make use of Pointers to develop programs in C language.
CO4	Develop programs to perform various operations on files using File Handling.

Course Contents:

Unit 1: Function Editing, Basics Of function, Types of Function, returning non-integers, external variable, scope rules, Recursion Function.	[6]
Unit 2: Structures and Unions Variable, Defining a Structure, Advantages of Structure. sizeof structure, Arrays of Structure, Structures and functions, Defining Union.	[6]
Unit 3: Pointers Pointers to Integers, Float, Characters, arrays and structures.	[6]
Unit 4: File Handling Introduction to dynamic memory allocation – malloc(), calloc(), realloc(). Introduction to file management, Opening Closing a file, Input/output operations on Files, Error Handling during I/O operations	[6]
Text Books: 1.C Programming Absolute Beginner's Guide, Que Publishing; 3rd edition (22 August 2013) 2.C Programming Language 2nd Edition, Peasrson Publication 3.Programming in C Practical Approach by Ajay Mittal, Pearson.Let Us C, By Yashwat Kanetkar.	

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Mini Project-III

PRJ03	PROJ	Mini Project-III	0-0-2	1Credits

Teaching Scheme:	Examination Scheme:
Practical:2hr/week	CA1:25 Marks CA2:25 Marks

Course Outcomes: At the end of the course students will be able to

CO1	Select the appropriate method for solving the problem
CO2	Make use of various engineering techniques and tools to give a solution
CO3	Justify the method/tools used to develop the solution.
CO4	Demonstrate tangible solutions to the problem
CO5	Describe the solution with the help of a project report and presentation.

About Hackathon

The project is a part of addressing societal and industrial needs. Hackathon is one of the platforms that students will use to solve real-world challenges. This course focuses on the selection of methods/engineering tools/analytical techniques for problem-solving.

Through this course, students gain a thorough understanding of engineering basics and ideas, gain practical experience, have the opportunity to display their skills and learn about teamwork, financial management, communication skills, and responsibility.

Guidelines

01	Every student shall undertake the Hackathon activity for semester V.
02	Minimum three and maximum of five students should work together in Hackathon.
03	The students have to work on different approaches and finalize the best methodology to solve the problem in consultation with the project guide.

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04	The students should use different tools /Techniques for the development of the solution to the problem
05	While developing solutions the student can take care of effective use of resources, follow ethical practices, finance management
06.	The solution should be optimal, sustainable, user-friendly and environment friendly.
07.	Critically analysis and testing of the solution provided.
08.	By using IPR, students should reserve their rights of innovations as well as communicate new findings to society with the help of research papers.

The committee of senior faculty members and a project guide will be appointed to monitor the progress and continuous evaluation of each project. The assessment shall be done jointly by the guide and committee members

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Industrial Training/Field Training-I

IFT01	PP.. II	Industrial Training/Field Training -I	0-0-0	Audit

Teaching Scheme	Examination Scheme:
NA	1:25 Marks 2:25 Marks

Course Description: -

Internship / Training is educational and career development opportunity, providing practical experience in a field or discipline. At the end of the fourth semester, every student should undergo practical training in an industry / professional organization / Research laboratory with the prior approval of the HOD.
/TPO/Principal the College and submit report along with the completion certification from the Industry / Organization. The report will be evaluated during the fifth semester by the departm

Course Outcomes: At the end of the course, students will be able to:

CO1	Ver	Tech cal knowledg cal industrial situations.
CO2	Dev	terpe ona' mmu n skills.
CO3	Disc dor	tivi ctio industry in which the Internship/training has
CO4	Wr	echn t.

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Pre-Requ[illegible]tes: - Basics of (Programme) Engineering, Good written and Oral
unica[illegible]

Guidelin[illegible] Stude[illegible]s:

01	Arrive [illegible]rk as [illegible]dule, rea[illegible]y to work and stay for the agreed upon time.
02	Pres[illegible] [illegible] self[illegible] [illegible] sion[illegible] [illegible] ner at all times, including being appropriately dressed at w[illegible]
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05	Co[illegible] [illegible] d sul[illegible] [illegible] ned t[illegible] [illegible] designated timelines. Meet all deadline.

Studen[illegible] Daily [illegible]

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