Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly known as West Bengal University of Technology)
Syllabus of B.Tech in Electronics and Computer Science
Effective from academic session 2023-2024

Semester-III

Course Code: BS-M301	Category: Engineering science
Course Name: Mathematics-III	Semester:3
L-T-P: 3-0-0	Credit:3
Total Lectures: 36	
Pre-Requisite: Concept Linear Algebra Determinant and its properties (up to third order)	

Unit	Content	Hrs/Unit
1	Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions.	8
2	Limit, continuity and partial derivatives, Chain rule, Implicit function, Jacobian, Directional derivatives, Total derivative; Maxima, minima and saddle points; Gradient, curl and divergence and related problems.	7
3	Double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar). Theorems of Green, Gauss and Stokes (Statement only) and related problems.	8
4.	First Order Differential Equation, Exact, Linear and Bernoulli's equations, Equations of first order but not of first degree: equations solvable for p, equations solvable for y, equations solvable for x	9
	and Clairaut's form, general & singular solution. [5L] Second order linear differential equations with constant coefficients, D-operator method, method of variation of parameters, Cauchy-Euler equation. [4L]	
5	Basic Concept of graph, Walk, Path Circuit, Euler and Hamiltonian graph, diagraph. Matrix Representation: Incidence & Adjacency matrix. Tree: Basic Concept of tree, Binary tree, Spanning Tree, KrusKal and Prim's algorithm for finding the minimal spanning tree.	8

Text book and Reference books:

1. Higher Algebra, S. K. Mapa, Levant Books.
2. Advanced Higher Algebra, Chakravorty and Ghosh, U N Dhar Pvt. Ltd.
3. Co-ordinate Geometry, S. L. Loney
4. Integral Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd.
5. Differential Calculus, Das and Mukherjee, U N Dhar Pvt. Ltd.
6. Advanced Engineering Mathematics, E Kreyszig
7. Advanced Engineering Mathematics, Chandrika Prasad & Reena Garg, Khanna Publishing House (AICTE Recommended Textbook -2018)

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Course Outcomes:

On completion of the course students will be able to	
CO-1	Express a logic sentence in terms of predicates, quantifiers, and logical connectives.
CO-2	Apply the rules of inference and methods of proof including direct and indirect proof forms, proof by contradiction, and mathematical induction.
CO-3	Use tree and graph algorithms to solve problems
CO-4	Evaluate Boolean functions and simplify expressions using the properties of Boolean algebra

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Course Code: ES- EC301	Category: Engineering science
Course Name: Analog & Digital Electronics	Semester:3
L-T-P: 3-0-0	Credit:3
Total Lectures: 40	
Pre-Requisite: Basic concept of the working of P-N diodes, BJT, FETs MOSFETs and OPAMP	

MODULE	**DESCRIPTION OF TOPIC**	**HRS/UNIT**
1	Transistor Biasing Circuits: Different types of biasing circuits for BJT and MOSFET, stability factors, bias compensation, DC & AC load line analysis and thermal runaway. Small Signal Analysis of BJT: Transistor hybrid model, derivation of voltage gain, current gain, input impedance and output impedance, trans-conductance,	7
2	Feedback and Oscillator Circuits: Feedback topologies and criteria, Wien bridge oscillator, Phase shift oscillator and Crystal oscillator.	4
3	Operational Amplifier (OPAMP): Ideal OPAMP, Equivalent circuit, Inverting and non-inverting configuration, summer, unity gain buffer, Differential amplifier, CMRR. Instrumentation amplifier and its application, comparator & Schmitt trigger, V-I and I-V converter, log and anti-log amplifier, precision rectifier, integrator and differentiator. Introduction to multi-vibrator, IC555, IC based power supply design.	7
4	Review of Number System, Signed and Unsigned Number. Logic Simplification: Review of Boolean Algebra and De Morgan's Theorem, SOP & POS forms, Canonical forms, Karnaugh's map, Binary codes, Code Conversion.	5
5	Combinational circuits - Adder and Sub tractor circuits, Encoder, Decoder, Comparator, Multiplexer, De Multiplexer and Parity Generator	6
6	Sequential Circuits - Basic Flip-flop & Latch, Flip-flops -SR, JK, D, T and JK Master-slave Flip Flops, Registers, Ring counter, Johnson counter Basic concept of Synchronous and Asynchronous counters, Design of Mod N Counter.	7
7	A/D and D/A conversion techniques – Basic concepts (D/A: R-2-R only A/D: successive approximation) Logic families- TTL, ECL, MOS and CMOS - basic concepts.	4

Text book and Reference books:

1. Microelectronics Engineering –Sedra & Smith-Oxford.
2. Analog Electronics, A.K. Maini, Khanna Publishing House (AICTE Recommended -2018)
3. Analog Electronics, L.K. Maheswari, Laxmi Publications (AICTE Recommended -2018)
4. Principles of Electronic Devices & circuits—B L Thereja & Sedha—S Chand
5. Digital Electronics – Kharate – Oxford
6. Digital Electronics – Logic & Systems by J.Bigmell & R.Donovan; Cambridge Learning.
7. Digital Logic and State Machine Design (3rd Edition) – D.J.Comer, OUP

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8. Electronic Devices & Circuit Theory – Boyelstad & Nashelsky - PHI
9. Bell-Linear IC & OP AMP—Oxford
10. P.Raja- Digital Electronics- Scitech Publications
11. Morries Mano- Digital Logic Design- PHI
12. R.P.Jain—Modern Digital Electronics, 2/e ,McGraw Hill
13. H.Taub & D.Shilling, Digital Integrated Electronics- McGraw Hill.
14. D.RayChaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers
15. Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
16. J.Bignell & R.Donovan-Digital Electronics-5/e- Cenage Learning.
17. Leach & Malvino—Digital Principles & Application, 5/e, McGraw Hill
18. Floyed & Jain- Digital Fundamentals-Pearson.

On completion of the course students will be able to	
CO-1	Understand the characteristics of transistors.
CO-2	Design sinusoidal and non-sinusoidal oscillators.
CO-3	Understand the functioning of OP-AMP and design OP-AMP based circuits.
CO-4	Develop different types Logic circuit simplification using various mapping and mathematical methods.
CO-5	Analyze, design and implement combinational circuits and sequential logic circuits
CO-6	Built the fundamental knowledge and analyze the operation of various A/D and D/A converters.

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Course Code: ES-EE302	Category: Engineering Science
Course Name: Circuit Theory and Networks	Semester:3
L-T-P: 3-0-0	Credit:3
Total Lectures: 37	
Pre-Requisite: Knowledge series and parallel circuits	

Unit	content	Hrs
1	**Introduction:** Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Lumped and Distributed, Passive and Active networks and systems. Independent & Dependent sources.	4
2	**Network Theorems:** Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's & Maximum power transfer theorem. Millman's theorem and its application in three phase unbalanced circuit analysis. Solution of Problems with DC & AC sources.	6
3	**Graph theory and Networks equations:** Concept of Tree, Branch, Tree link, Incidence matrix, Tie-set matrix and loop currents, Cut set matrix and node pair potentials.	5
4	**Laplace transforms**: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.	6
5	**Fourier method of waveform analysis:** Fourier series and Fourier Transform (in continuous domain only). Application in circuit analysis, Solution of Problems	6
6	**Two port networks analysis:** Open circuit Impedance & Short circuit Admittance parameter, Transmission parameters, Hybrid parameters and their inter relations. Driving point impedance & Admittance. Solution of Problems	4
7	**Filter Circuits:** Analysis and synthesis of Low pass, High pass, Band pass, Band reject, All pass filters (first and second order only) using operational amplifier. Solution of Problems	6

Text books:

1. Networks & Systems, Ashfaq Husain, Khanna Book Publishing, New Delhi
2. Networks and Systems, D. Roy Chowdhury, New Age International Publishers
3. Network Analysis and Synthesis, C.L. Wadhwa, New Age International Publishers
4. Circuit and Networks: Analysis and synthesis, A. Sudhakar & S.S. Palli4th edition. Tata Mc Graw Hill Education Pvt. Ltd.
5. Circuit theory, Dr. Abhijit Chakrabarty, Dhanpat Rai & Co Pvt. Ltd

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Course Outcomes:

On completion of the course students will be able to		
CO-1	Define the various network and systems	BT-1
CO-2	Understand the different network theorems	BT-2
CO-3	Apply the different mathematical tools in the domain of network theory	BT-3
CO-4	Understand two port networks	BT-2
CO-5	Analysis the filter circuit.	BT-4

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Course Code: PC-ECS301	Category: Program core
Course Name: Data Structure & Algorithms	Semester:3
L-T-P: 3-0-0	Credit:3
Total Lectures: 36	
Pre-Requisite: Knowledge of programming language(Preferable C)	

Module	**Content**	**No. of Lecture (Hrs.)**
1	**Introduction:** Basic Terminologies: Elementary Data Organizations, **Data Structure Operations:** insertion, deletion, traversal etc.; Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. **Searching:** Linear Search and Binary Search Techniques and their complexity analysis.	8
2	**Stacks and Queues:** ADT Stack and its operations: Algorithms and their complexity analysis, Applications of Stacks: Expression Conversion and evaluation – corresponding algorithms and complexityanalysis. ADT queue, Types of Queue: Simple Queue, Circular Queue, Priority Queue; Operations on each types of Queues: Algorithms and their analysis.	6
3	**Linked Lists:** ***Singly linked lists:*** Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into,Deletion from linked list; Linked representation of Stack and Queue, Header nodes, ***doubly linked list:*** operations on it and algorithmic analysis; Circular Linked Lists: all operations their algorithms and the complexity analysis.	10
4	**Trees:** Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree; Tree operations on each of the trees and their algorithms with complexity analysis. Applications of Binary Trees. B Tree, B+ Tree: definitions, algorithms and analysis, Red-Black tree, Binomial tree.	8
5	**Sorting and Hashing:** Internal and external sorting, In-place and out- of-place sorting, stable and unstable sorting, Objective and properties of different sorting algorithms: Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Bubble Sort, Heap Sort, Radix sort; Performance and Comparison among all the methods, **Hashing:** load factor, collision resolution techniques, double hashing, rehashing. **Graph:** Basic Terminologies and Representations, Graph search andtraversal algorithms and complexity analysis.	6

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Reference books:

1. Data Structures & Algorithms using C, R.S. Salaria, Khanna Publishing House, New Delhi,2018.
2. Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, ComputerScience Press.
3. Data Structures and Algorithms Made Easy: Data Structures and Algorithmic Puzzles 5th ed.Edition.
4. "Data Structures in C" by Aaron M. Tenenbaum.
5. "Data Structures" by S. Lipschutz.
6. "Data Structures Using C" by Reema Thareja.
7. "Data Structure Using C", 2/e by A.K. Rath, A. K. Jagadev.
8. "Introduction to Algorithms" by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest,Clifford Stein

COURSE OUTCOMES :

On completion of the course students will be able to

Course Outcomes	Details	Action Verb	Knowledge Level
CO1	Construct algorithms from problems.	Construct	K3
CO2	Understand the basics of abstract data types.	Understand	K2
CO3	Categorize the property of linear and nonlinear data structures.	Categorize	K4
CO4	Learn the use of Tree and graph.	Learn	K3
CO5	Compare different shorting and searching methods.	Compare	K5
CO6	Learn the use of hashing.	Learn	K3

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Course Code: PC-ECS302	Category: Program core
Course Name: Computer Organization	Semester:3
L-T-P: 3-0-0	Credit:3
Total Lectures: 36	

Module	Content	Lecture/Hour
1	Basic organization of the stored program computer and operation sequence for execution of a program. Role of operating systems and compiler/assembler. Fetch, decode and execute cycle, Concept of operator, operand, registers and storage, Instruction format. Instruction sets and addressing modes. Commonly used number systems. Fixed and floating point representation of numbers.	8
2	Overflow and underflow. Design of adders – ripple carry and carry look ahead principles. Design of ALU. Fixed point multiplication -Booth's algorithm. Fixed point division - Restoring and non-restoring algorithms. Floating point - IEEE 754 standard.	8
3	Memory unit design with special emphasis on implementation of CPU-memory interfacing. Memory organization, static and dynamic memory, memory hierarchy, associative memory. Cache memory, Virtual memory. Data path design for read/write access.	10
4	Design of control unit - hardwired and microprogrammed control. Introduction to instruction pipelining. Introduction to RISC architectures. RISC vs CISC architectures. I/O operations - Concept of handshaking, Polled I/O, interrupt and DMA.	10
Pre-Requisite: Concept of basic components of a digital computer, Boolean Algebra, Basic number systems, Binary numbers, representation of signed and unsigned numbers, Binary Arithmetic		

Text book and Reference books:

1. Mano, M.M., “Computer System Architecture”, PHI.
2. Behrooz Parhami “Computer Architecture”, Oxford University Press
3. Hayes J. P., “Computer Architecture & Organisation”, McGraw Hill,
4. Hamacher, “Computer Organisation”, McGraw Hill,
5. N. senthil Kumar, M. Saravanan, S. Jeevananthan, “Microprocessors and Microcontrollers” OUP
6. Chaudhuri P. Pal, “Computer Organisation & Design”, PHI,
7. P N Basu- “Computer Organization & Architecture” ,Vikas Pub
8. Rajaraman – “Computer Organization & Architecture”, PHI
9. B.Ram – “Computer Organization & Architecture”, Newage Publications

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Course Outcomes:

Course Outcomes	CO statement	Knowledge Level
CO1	**Explain** the structural and functional organization of a computer system.	Understand (Level 2)
CO2	**Demonstrate** basic number systems, Binary numbers, representation of signed and unsigned numbers, Floating point representation.	Apply (Level 3)
CO3	**Demonstrate** different circuit designs using basic gates and hardware architectures.	Apply (Level 3)
CO4	**Define** the addressing modes, instruction formats, and instruction pipeline.	Remember (Level 1)
CO5	**Analyse** various components of memory hierarchy in terms of access time, cost.	Analyse (Level 4)
CO6	**Explain** the concept of I/O interfacing and various taxonomy of I/O data transfer	Understand (Level 2)

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Course Code: HM-HU301	Category: Humanities & social science
Course Name: Economics for Engineers	Semester:3
L-T-P: 3-0-0	Credit:3
Total Lectures: 36	
Pre-Requisite: Mathematics	

Unit	Content	Hrs/Unit
1	1. Economic Decisions Making – Overview, Problems, Role, Decision making process. 2. Engineering Costs & Estimation – Fixed, Variable, Marginal & Average Costs, Sunk Costs, Opportunity Costs, Recurring And Nonrecurring Costs, Incremental Costs, Cash Costs vs Book Costs, Life-Cycle Costs; Types Of Estimate, Estimating Models - Per- Unit Model, Segmenting Model, Cost Indexes, Power-Sizing Model, Improvement & Learning Curve, Benefits.	9
2	3. Cash Flow, Interest and Equivalence: Cash Flow – Diagrams, Categories & Computation, Time Value of Money, Debt repayment, Nominal& Effective Interest. 4. Cash Flow & Rate of Return Analysis – Calculations, Treatment of Salvage Value, Annual Cash Flow Analysis, Analysis Periods; Internal Rate of Return, Calculating Rate of Return, Incremental Analysis; Best Alternative Choosing an Analysis Method, Future Worth Analysis, Benefit-Cost Ratio Analysis, Sensitivity and Breakeven Analysis. Economic Analysis In The Public Sector -Quantifying And Valuing Benefits & drawbacks.	9

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3	5. Inflation and Price Change – Definition, Effects, Causes, Price Change with Indexes, Types of Index, Composite vs Commodity Indexes, Use of Price Indexes In Engineering Economic Analysis, Cash Flows that inflate at different Rates. 6. Present Worth Analysis: End-Of-Year Convention, Viewpoint Of Economic Analysis Studies, Borrowed Money Viewpoint, Effect Of Inflation & Deflation, Taxes, Economic Criteria, Applying Present Worth Techniques, Multiple Alternatives. 7. Uncertainty In Future Events - Estimates and Their Use in Economic Analysis, Range Of Estimates, Probability, Joint Probability Distributions, Expected Value, Economic Decision Trees, Risk, Risk vs Return, Simulation, Real Options.	9
4.	8. Depreciation - Basic Aspects, Deterioration & Obsolescence, Depreciation And Expenses, Types Of Property, Depreciation Calculation Fundamentals, Depreciation And Capital Allowance Methods, Straight-Line Depreciation Declining Balance Depreciation, Common Elements Of Tax Regulations For Depreciation And Capital Allowances. 9. Replacement Analysis - Replacement Analysis Decision Map, Minimum Cost Life of a New Asset, Marginal Cost, Minimum Cost Life Problems. 10. Accounting – Function, Balance Sheet, Income Statement, Financial Ratios Capital Transactions, Cost Accounting, Direct and Indirect Costs, Indirect Cost Allocation.	9

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Text book and Reference books:

1. James L.Riggs, David D. Bedworth, Sabah U. Randhawa : Economics for Engineers 4e , Tata McGraw-Hill
2. Donald Newnan, Ted Eschembach, Jerome Lavelle: Engineering Economics Analysis, OUP
3. John A. White, Kenneth E. Case, David B. Pratt : Principle of Engineering Economic Analysis, John Wiley
4. Sullivan and Wicks: Engineering Economy, Pearson
5. R.Paneer Seelvan: Engineering Economics, PHI
6. Michael R Lindeburg : Engineering Economics Analysis, Professional Pub
7. Premvir Kapoor, Sociology & Economics for Engineers, Khanna Publishing House (AICTE Recommended Textbook – 2018)

Course Outcome:

On completion of the course students will be able to	
CO-1	Make different economic decisions and estimate engineering costs by applying different cost estimation models
CO-2	Understand the concepts of depreciation and replacement analysis and solve associated problems, process of inflation and use different price indices to adjust for its effect and also the scope of Finance and the role of financial planning and management.
CO-3	Apply the various concepts of Accounting like balance sheet and ratio analysis.
CO-4	Take decisions regarding different engineering projects by using various criteria like rate of return analysis, present worth analysis, cost-benefit analysis etc.
CO-5	Create cash flow diagrams for different situations and use different interest formulae to solve associated problems.

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PRACTICAL:

Course Title: Analog and Digital Electronics Lab	**Course Code:ES-EC391**
Type of Course: Practical	Course Designation: Compulsory
Semester: III	Contact Hours:3P/Week
Continuous Assessment: 40 Marks	Final Exam: 60 marks
Writer: Course Coordinator	Credit Points: 1.5
Pre-Requisite: 1. Basic concept of the working of P-N diodes, BJT and FET. 2. OPAMP as a basic circuit component and concept of Feedback. 3. Concept of Number Systems and knowledge of Basic Gates.	
Unit	List of experiments
1	Analog Electronics 1. Study of the input and output characteristics curves of BJT. 2. Study of the input and output characteristics curves of FET. 3. Study of timer circuit using NE555 & configuration for monostable & astable multivibrator. 4. Construction & study of Bistable multivibrator using NE555. 5. Realization of Adder and Subtractor circuit using current mirror & level shifter circuit using Operational Amplifiers. 6. Design of Differentiator and Integrator circuit using Operational Amplifiers. 7. Realization of Wien Bridge circuit using Operational Amplifiers. 8. Study of ADC and DAC.
2	Digital Electronics 1. Realization of basic gates using Universal logic gates. 2. Code conversion circuits- BCD to Excess-3 & vice-versa. 3. Construction of simple arithmetic Circuits-Adder, Subtractor. 4. Construction of simple Decoder & Multiplexer circuits using logic gates. 5. Realization of RS-JK & D flip-flops using Universal logic gates. 6. Design of Shift Register using J-K / D Flip Flop. 7. Realization of Synchronous and Asynchronous Up/Down counter. 8. Realization of Ring counter & Johnson's counter.

COURSE OUTCOMES (COs):

On the completion of the course students will be able to

Course outcomes	**Details**
CO1	Set up standard experimental methods and select proper instruments to evaluate performance characteristics of different electronic circuits.
CO2	Determine experimental procedures for different types of electronic circuits.
CO3	Evaluate possible reasons of inconsistency between experimental

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	observations and theoretical values and interpret the experimental data.
CO4	Demonstrate the basic operation of different combinational circuits including arithmetic circuits.
CO5	Evaluate the applications of flip-flops as binary registers and counters used in large digital integrated circuits.
CO6	Design mini analog and digital electronic circuit based systems.

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Course Title: Simulation Workshop	**Course Code: ES-EE392**
Type of Course: Practical	Course Designation: Compulsory
Semester: III	Contact Hours:3P/Week
Continuous Assessment: 40 Marks	Final Exam: 60 marks
	Credit Points: 1.5
Pre-Requisite: 1. Programming language and basic circuits	

Laboratory Experiments:

1.	MATLAB basic operation
2.	Matrix operation
3.	Nodal analysis using MATLAB
4.	Loop analysis using MATLAB
5.	Transient analysis of RC network using MATLAB
6.	Transient analysis of RL network using MATLAB
7.	Transient analysis of RLC series and parallel network using MATLAB
8.	Fourier Series using MATLAB
9.	Fourier Transform and Laplace Transform using MATLAB
10.	Introduction to different loop structure (For, if-else statement) using Python
11.	Some mathematical operation using Python
12.	Simulate Electronic Circuit using Python
13.	Introduction to R software

Course Outcomes:

Build the software skill for analysis and design of circuit-based simulations.	BT-6
Use of various circuit components for their appropriate use in software domain.	BT-3
Build the technical writing skill for effective representation of experimental works.	BT-6

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Course Title: Data Structure & Algorithm Lab	Code: PC-ECS391
Type of Course: Practical	Course Designation: Compulsory
Semester: 3rd	Contact Hours: 3P/week
Continuous Assessment: 40 Marks	Final Exam: 60 Marks
Credit Points: 1.5	

Laboratory Experiments:	
	Linear Data Structure
1	Implementation of array operations: Searching, insertion, deletion, display, traverse and update
2	**Stacks and Queues:** adding, deleting elements Circular Queue: Adding & deleting elements
3	**Merging Problem:** Evaluation of expressions operations on Multiple stacks & queues
4	**Implementation of linked lists:** inserting, deleting, inverting a linked list. Implementation of stacks& queues using linked lists
5	Polynomial addition, Polynomial multiplication
	Non-Linear Data Structure
6	Searching techniques: Linear search and Binary Search
7	Implementation of sorting techniques: Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, QuickSort, Heap Sort.
8	Graph traversal: BFS, DFS
9	Recursive and non-recursive traversal of Trees, MST, Prims and Kruskal algorithm
10	Threaded binary tree traversal. AVL tree implementation
11	Hash tables implementation
12	Small project based assignment

COURSE OUTCOMES (COs)

On completion of the course students will be able to

Course Outcomes	**Details**	**Action Verb**	**Knowledge Level**
CO1	Construct algorithms from problems.	Construct	K3
CO2	Understand the basics of Stack, Queue.	Understand	K2
CO3	Categorize the necessarily of linked list and array implementation.	Categorize	K4
CO4	Learn the real life use of Tree and graph.	Learn	K3
CO5	Compare different shorting and searching methods.	Compare	K5

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CO6	Understand the implementation mechanism of shorting and searching.	Understand	K2

Reference books:

1. Data Structures & Algorithms using C, R.S. Salaria, Khanna Publishing House, New Delhi,2018.
2. Fundamentals of Data Structures, Illustrated Edition by Ellis Horowitz, Sartaj Sahni, ComputerScience Press.

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Course Title: Computer Organisation Lab	**Code: PC-ECS392**
Type of Course: Practical	Course Designation: Compulsory
Semester: 3rd	Contact Hours: 3P/week
Continuous Assessment: 40 Marks	Final Exam: 60 Marks
Credit Points: 1.5	

COURSE OBJECTIVE:

1. Demonstrate the behaviour of various logic gates.
2. Analyse the combinational circuits for basic components of computer system and applications.
3. Analyse the operational behaviour and applications of various flip-flops.
4. Experiment with Arithmetic logic units and different types of memory blocks.

PRE-REQUISITE:

1. Concept of basic components of a digital computer, Basic concept of Fundamentals & Programme structures.
2. Basic number systems, Binary numbers, representation of signed and unsigned numbers,
Binary Arithmetic as covered in Basic Computation, Boolean Algebra.

UNIVERSITY SYLLABUS:

Laboratory Experiments:	
1	Familiarity with IC-chips: a) Multiplexer, b) Decoder, c) Encoder b) Comparator Truth Table verification and clarification from Data-book.
2	Design an Adder/Subtractor composite unit.
3	Design a BCD adder.
4	Design of a 'Carry-Look-Ahead' Adder circuit.
5	Use a multiplexer unit to design a composite ALU.
6	Use ALU chip for multibit arithmetic operation
7	Implement read write operation using RAM IC
8	8. (a) & (b) Cascade two RAM ICs for vertical and horizontal expansion.

Text book and Reference books:

1. Mano, M.M., "Computer System Architecture", PHI.
2. Chaudhuri P. Pal, "Computer Organisation & Design", PHI.
3. P. N. Basu, "Computer Organization & Architecture", Vikas Publications.
4. Rajaraman, "Computer Organization & Architecture", PHI.
5. B. Ram, "Computer Organization & Architecture", New Age Publications.

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COURSE OUTCOMES (COs):
On completion of the course students will be able to

Course Outcomes	CO statement	Knowledge Level
CO1	**Demonstrate** the behaviour of various integrated chips (IC): multiplexer, decoder, encoder, comparator and verify corresponding truth tables.	Apply (Level 3)
CO2	**Examine** the circuit of an adder/subtractor composite unit, BCD adder, carry-look ahead-adder.	Apply (Level 3)
CO3	**Experiment with** an arithmetic and logic units using multiplexer unit for single bit and multi bit arithmetic operations.	Apply (Level 3)
CO4	**Examine** read write operation using RAM IC and cascade two RAM ICs for vertical and horizontal expansion.	Apply (Level 3)

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Course Code: MC-ES301	Category: Mandatory course	
Course Name: Environmental science	Semester:3	
L-T-P: 2-0-0	Credit:0	
Total Lectures: 30		
Pre-Requisite: Knowledge of chemistry		
MODULE	DESCRIPTION OF TOPIC	HRS/UNIT
1	Basic ideas of environment, basic concepts, man, society & environment, their interrelationship. Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development. Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.	4
2	Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem components types and function. Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundarban); Food chain [definition and one example of each food chain], Food web. Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. Biodiversity- types, importance, Endemic species, Biodiversity Hotspot, Threats to biodiversity, Conservation of biodiversity.	4
3	Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause. Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems. Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food.Global warming and its consequence, Control of Global warming. Earth's heat budget. Lapse rate: Ambient lapse rate Adiabatic lapse rate,	8

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	atmospheric stability, temperature inversion (radiation inversion). Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of nitrogen, oxides of sulphur, particulate, PAN. Smog, Photochemical smog and London smog. Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other greenhouse gases, effect of ozone modification. Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).	
4	Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. River/Lake/ground water pollution: River: DO, 5 day BOD test, Seeded BOD test, BOD reaction rate constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication [Definition, source and effect]. Ground water: Aquifers, hydraulic gradient, ground water flow (Definition only) Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic	6
5	Lithosphere; Internal structure of earth, rock and soil Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).	3
6	Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise, neighborhood noise] Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, L_{10} (18hr Index), Ld_n . Noise pollution control.	5

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	Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol.	

Text books/ reference books:

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. M.P. Poonia, Environmental Studies, Khanna Publishing House, New Delhi, 2018
3. De, A. K., "Environmental Chemistry", New Age International.
4. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi 2019

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