Department of Computer Science & Engineering

3rd Semester

Syllabus Formed for Autonomy (2018-19)

B.Tech(CSE) Curriculum
2018 Admission Batch Onwards

3rd Semester								
SL No	**Type**	**Code**	**A. THEORY**	**Contact hours**			Total	Cr
				L	T	P		
1	BS	M(CSE)301	Mathematics-III	3	1	0	4	4
2	BS	PH301	Physics-II	3	0	0	3	3
3	ES	EE(CSE) 301	Circuit Theory and Network	2	0	0	2	2
4	PC	CS301	Digital Electronics and Computer Organization	3	0	0	3	3
5	PC	CS302	Data Structures	3	0	0	3	3
Total of Theory							**15**	**15**
B. PRACTICAL								
6	BS	PH391	Physics-II Lab	0	0	3	3	1.5
7	PC	CS391	Digital Electronics and Computer Organization Lab	0	0	3	3	1.5
8	PC	CS392	Data Structures Lab	0	0	3	3	1.5
9	PC	CS393	Programming with C++	1	0	2	3	1.5
Total of Practical							**12**	**6**
Total of Theory+ Practical+ Sessional							**27**	**21**
D. PROJECT*								
10		M(CSE)351	Project on Mathematics-III	0	0	1	1	0.5
11		PH351	Project on Physics-II	0	0	1	1	0.5
12		EE(CSE) 351	Project on Circuit Theory and Network	0	0	1	1	0.5
13		CS351	Project on Data Structures	0	0	1	1	0.5
14		CS352	Project on Digital Electronics and Computer Organization	0	0	1	1	0.5
*** Student need to select any four Project (Total Credit: 0.5 x4=2)**							**2**	**2**
Total of Theory+ Practical+ Sessional+ Project							**29**	**21+2**

Paper Name: Mathematics - III
Paper Code: M(CSE) 301
Total Contact Hours: 44
Credit: 4

Prerequisite:

The students to whom this course will be offered must have the concept of (10+2) standard set theory, calculus, basic probability.

Course Objectives:

The objective of this course is to disseminate the prospective engineers with the knowledge of Graph Theory, Algebraic Structure, Propositional Logic, Number Theory and Recurrence Relation. It also aims to equip the students with concepts and tools of probability distribution as an intermediate to the advanced level of applications that they would find useful in their disciplines.

Course Outcomes (COs):
On successful completion of the learning sessions of the course, the learner will be able to:

CODES	BLOOM'S TAXONOMY	DESCRIPTIONS
M(CSE) 301.1	Remembering	Recall the distinctive characteristics of probability distribution, algebraic structure, number theory, recurrence relation, propositional logic and graph theory.
M(CSE) 301.2	Understanding	Demonstrate the theoretical working of probability distribution, algebraic structure, number theory, recurrence relation, propositional logic and graph theory.
M(CSE) 301.3	Applying	Compute the probability of real world uncertain phenomena by indentifying probability distribution that fits the phenomena.
M(CSE) 301.4	Applying	Formulate different counting problems and solve the recurrence relation using underlying concept.
M(CSE) 301.5	Applying	Construct the shortest path and minimal spanning tree from a given graph using the algorithms of graph theory.

Course Content:

MODULE I: ***Probability Distributions: (10 Lectures)***

Random Variable: Discrete and Continuous (definition & examples); Probability Distribution (definition & examples); Probability Mass Function, Probability Density Function and Distribution Function for a single random variable only (definition, properties & related problems); Expectation, Variance and Standard Deviation for a single random variable only (definition, properties & related problems); Binomial Distribution, Poisson Distribution, Binomial Approximation to Poisson Distribution and Normal Distribution (problems only), Mean, Variance and Standard Deviation of Binomial, Poisson and Normal Distribution (problems only).

Module II: ***Propositional Logic: (6 Lectures)***

Introduction to Propositional Calculus**,** Propositions, Logical Connectives, Conjunction, Disjunction, Negation and their truth table. Conditional Connectives, Implication, Converse, Contrapositive, Inverse, Bi-conditional statements with truth table, Logical Equivalence, Tautology, Normal forms-CNF, DNF.

Module III: ***Number Theory: (6 Lectures)***

Well Ordering Principle, Divisibility theorem (without proof) and properties of divisibility; Fundamental theorem of Arithmetic; Euclidean Algorithm for finding G.C.D and some basic properties of G.C.D with simple examples.

Module IV: ***Recurrence Relation: (5 Lectures)***

Recurrence relations: Formulation of different counting problems in terms of recurrence relations, Solution of recurrence relations with constant coefficients by (i) The iterative method (ii) Characteristic roots method (iii) Generating functions method.

Module V: ***Algebraic Structures: (5 Lectures)***

Group (definition), Lagrange's theorem, Subgroup, Normal subgroup, Cyclic group, Permutation group, Symmetric group (S3), Definition of Ring and Field.

Module VI: ***Graph Theory: (12 Lectures)***

Graph theory, important theorems and problems, digraphs, weighted graph, connected and disconnected graph, Bipartite graph, complement of a graph, regular graph, complete graph, walk, path, circuit, Euler graph, cut set, cut vertices, adjacency and incidence matrices of a graph(digraph),Isomorphism,

Tree, Important theorems: Binary Tree, Spanning Tree, minimal spanning tree, Dijkstra's algorithm, Kruskal's Algorithm, Prim's Algorithm.

Project Domains:

1. Study of physical processes through Graph theory.
2. Application of Propositional Logic in real world engineering problems.

3. Study of uncertainty in real world phenomena using probability distribution.
4. Application of Abstract Algebra in engineering problems.

Text Books:

1. Das, N.G. *Probability and Statistics*; The McGraw Hill Companies.
2. Gupta, S. C. and Kapoor, V. K. *Fundamentals of Mathematical Statistics*, Sultan Chand & Sons.
3. Deo, N. *Graph Theory with Applications to Engineering and Computer Science*, Prentice Hall.
4. Mapa, S. K. *Higher algebra: Abstract and Linear*, Levant, 2011.
5. Chakraborty, S. K. and Sarkar, B. K. *Discrete Mathematics*, OXFORD University Press.

Reference Books:

1. Lipschutz, S. *Theory and Problems of Probability (Schaum's Outline Series)*, McGraw Hill Book. Co.
2. Spiegel, M. R. *Theory and Problems of Probability and Statistics (Schaum's Outline Series)*, McGraw Hill Book Co.
3. Grewal, B. S. *Higher Engineering Mathematics*, Khanna Pub.
4. Kreyzig, E. *Advanced Engineering Mathematics*, John Wiley and Sons.
5. Sharma, J.K. *Discrete Mathematics*, Macmillan.
6. Spiegel, M. R., Schiller, J.J. and Srinivasan, R.A. *Probability and Statistics* (Schaum's Outline Series), TMH.

CO-PO Mapping:

PO / CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**P10**	**P11**	**P12**
M(CSE) 301.1	3	1	1	-	-	-	-	-	-	-	-	1
M(CSE) 301.2	3	2	1	-	-	-	-	-	-	-	-	1
M(CSE) 301.3	3	2	2	-	-	-	-	-	-	-	-	1
M(CSE) 301.4	3	2	2	-	-	-	-	-	-	-	-	1

M(CSE) 301.5	3	2	2	-	-	-	-	-	-	-	-	1

Paper Name: Physics-II (Gr-B)
Paper Code: PH 301 [For CSE and IT]
Contacts: 3L
Credit: 3 **Total no. of lectures: 35 L**

Module 1: Quantum Mechanics-II, Quantum Computation and Communication (12L)

1.01: Quantum Mechanics-II

Formulation of quantum mechanics and Basic postulates; Operator correspondence- Measurements in Quantum Mechanics- Eigen value, Eigen function, superposition principle, orthogonality of wave function, expectation value. Commutator. 3L

Time dependent Schrödinger's equation, formulation of time independent Schrödinger's equation by method of separation of variables, Schrödinger's equation as energy eigen value equation, Application of Schrödinger equation – Particle in an infinite square well potential (1-D and 3-D potential well; Discussion on degenerate levels), 1D finite barrier problem and concept of quantum tunnelling (solve only $E<V_0$). 4L

1.02: Quantum Computation and Communication

The idea of n- dimensional vector space, use of 'bra-ket' notation, matrix representation of bra &kets; basis, Hilbert space; Pauli matrices. 2L

Idea of qubit and examples of single qubit logic gates- Classical bits, qubit as a two level system; Bloch vector, Pauli gate, Hadamard gate, Phase shift gate, Quantum circuits related to Quantum gates. 3L

Module 2: Statistical Mechanics (6L)

Module 2.01: Basics of Statistical Mechanics:

Concept of energy levels and energy states. Microstates, macrostates and thermodynamic probability, MB, BE, FD, statistics (Qualitative discussions)- physical significance, conception of bosons, fermions, classical limits of quantum statistics, Fermi distribution at zero & non-zero temperature, Concept of Fermi level. 4L

Module 2.02: Applications of Statistical Mechanics:

Qualitative study: Fermi level in metals, total energy at absolute zero and total number of particles.Fermi level for intrinsic and extrinsic semiconductors (pictorial representations on temperature dependence and doping concentration viz. p type, n-type). 2L

Module 3: Storage and display devices (3L)

3.01: Different storage and display devices-Magnetic storage materials, Hard disc (examples related to computers compared with semiconductor storage viz. Pendrive), Operation and application of CRT, Liquid crystal display (LCD), LED, Plasma display, Thin film transistor display). 3L

Module 4 : Concept of Polarisation (3L)

4.01 : Definition, Plane of polarization, Plane of vibration, Malus Law, Fundamental concepts of plane, circular & elliptical polarizations (only qualitative idea) with examples, Brewster's law, Double refraction : Ordinary & Extra ordinary rays, Nicol's prism, Engineering applications in E.M.Theory, Numerical problems 3L

Module 5: Electricity and Magnetism (8L)

Module 5.01:Electrostatics

Gauss's law in integral form and conversion into differential form, Equation of continuity, Extend to Poisson's & Laplace's equation, Application to parallel plate, spherical and cylindrical capacitors. 3L

Module 5.02: Magnetostatics:

Lorentz force (concept in Hall effect-), force on a small current element placed in a magnetic field. Biot-Savart law- non existence of magnetic monopole, Ampere's circuital law, Magnetic vector and scalar potential. 3L

Module 5.03: Electro-magnetism &Electromagnetic theory

Faraday's law, Concept of displacement current, Maxwell's field equations with physical significance, wave equation in free space, transverse nature of electromagnetic wave. 2L

Module 6: Physics of Nanomaterials (3L)

Reduction of dimensionality, properties of nanomaterials, Quantum wells (two dimensional), Quantum wires (one dimensional), Quantum dots (zero dimensional); Application of nanomaterials (CNT, grapheme, electronic, environment, medical). 3L

List of recommended Books:

Module 1:

1. Advanced Quantum Mechanics-J. J. Sakurai (TMH)
2. Quantum Mechanics-Schiff (Addison-Wesley)
3. Quantum Computation and Quantum Information(10th Anniversary Edition)-Nielsen & Chuang (Cambridge University Press)
4. The physics of quantum information-Dirk Bouwmeester, Artur K. Ekert, Anton Zeilinger (Springer)
5. Quantum Mechanics-Cohen Tanuje.
6. Advanced Quantum Mechanics-P.A.M. Dirac

Module 2.

Statistical Mechanics by B.B. Laud

Statistical Mechanics by Singh and Singh

Statistical Mechanics by Satyaprakash

Module 3

1 Introduction to solid state physics-Kittel (TMH)
2. Solid State Physics- Ali Omar (Pearson Eduction)
3. Solid state physics- S. O. Pillai
4. Solid State Physics-A. J. Dekker (Prentice-Hall India)
5. Materials Science-Raghavan

Module 4:

Optics-A. K. Ghatak (TMH)
Optics-B.D. Gupta (Books and Allied Publ)

Module 5:

1. Electromagnetics-B.B. Laud (TMH)
2. Electricity Magnetism-B.Ghosh (Book & Allied Publisher)
3. Electricity Magnetism-Chattopadhyay & Rakshit (New Central Book Agency)
4. Electricity Magnetism-Fewkes and Yardwood (Oxford University Press)

Module 6

6. Nanotechnology-Rakesh Rathi (S. Chand Publishers)
7. Integrated Electronics-Millman Halkias (TMH)
8. Nanotechnology-Rakesh Rathi (S. Chand Publishers)
9. Nanoscience-H. E. Schaefer (Springer)

Genarl Book:

1. Engineering Physics by **Khan** and Panigrahi Publisher: Oxford.

* How staff works website

Stream: Computer Science & Engineering
Paper Name: Circuit Theory and Network
Paper Code: EE(CSE)301
Contact Hours/Week: (2L)
Credit: 2
Total Contact Hours: 28

Prerequisite: Fundamental concepts of Basic Electrical Engineering

Course Objective:

This course is intended for CSE Engineering students to facilitate the student's development into computer engineering investigation. The course has been designed to introduce fundamental principles of electrical circuits as well as the technical skills to analyze such simple circuits. It is a course suitable for students pursuing computer engineering as well as other related engineering disciplines.

Course outcomes:

At the end of the course, students are able to:
EE(CSE)301 .1 Understand Kirchhoff's Laws and Networks theorem for simple circuit analyses
EE(CSE)301.2 Apply Laplace Transform for steady state and transient analysis
EE(CSE)301.3. Analyze the response of Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals.
EE(CSE)301.4. Understand two port network parameters through solving related numerical problems
EE(CSE)301.5. Analyze various types of network topology matrices by using graph theory as applied to electrical network analysis

CO/PO Mapping (**3/2/1-**indicates strength of correlation) **3-strong, 2-medium, 1-weak**												
Cos	**Programme Outcomes(Pos)**											
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
EE(CSE) 301.1	**3**	**2**							**2**			
EE(CSE) 301.2			**2**	**3**								

EE(CSE) 301.3	**3**	**2**	**1**									
EE(CSE) 301.4			**2**	**3**								
EE(CSE) 301.5	**2**	**1**	**2**				**1**					

Module	Content	Hour(28)
1	**Introduction:** Continuous & Discrete, Fixed & Time varying, Linear and Nonlinear, Passive and Active networks and systems. Independent & Dependent sources, Step, Ramp, Impulse, Sinusoidal, Square, Saw tooth signals.	**2**
2	**Network Equations:** Formulation of network equations, Source transformation, Loop variable analysis, Node variable analysis. Network theorem: Superposition, Thevenin's, Norton's & Maximum power transfer theorem and Millman's theorem. Solution of Problems with DC & AC sources.	**6**
3	**Resonance circuits:** Series and parallel resonance- their frequency response, Quality factor, Half Power Points, and bandwidth. Phasor diagrams, Transform diagrams**,** Practical resonant and series circuits, Solution of Problems	**3**
4	**Coupled circuits:** Magnetic coupling, polarity of coils, polarity of induced voltage, concept of Self and mutual inductance, Coefficient of coupling, Solution of Problems.	**2**
5	**Graph of Network**: Concept of Tree and Branch, tree link, junctions, **(*)** Incident matrix, Tie set matrix, Determination of loop current and node voltages.	**4**
6	**Circuit transients:** DC transients in R-L and R-C Circuits with and without initial charge, (*) R-L-C Circuits, AC Transients in sinusoidal R-L, R-C and R-L-C Circuits, Solution of Problems	**2**
7	**Laplace transforms:** Concept of Complex frequency , transform of *f(t)* into *F(s)* , transform of step, exponential, over damped surge, critically damped surge, damped and un-damped sine functions , properties of Laplace transform , linearity, real differentiation, real integration, initial value theorem and final value theorem , inverse Laplace transform , application in circuit analysis, Partial fraction expansion, Solution of problems.	**5**
8	**Two Port Networks Analysis:** Relationship of Two port network variables, short circuit admittance parameters, open circuit impedance parameters, transmission parameters, relationship between parameter sets, network functions for ladder network and general network.	**4**

Text books :

1. A. Chakrabarti: Circuit Theory Analysis & Synthesis

References :

a. Sudhakar:Circuits & Networks:Analysis & Synthesis 2/e TMH New Delhi
b. Roy Choudhury D., "Networks and Systems", New Age International Publishers.

Paper Name: Digital Electronics and Computer Organization
Paper Code: CS301
Contact Hours/Week: 3
Credit: 3
Total Contact Hours: 36

Course Objective: Objective of digital electronics is to acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits, to prepare students to perform the analysis and design of various digital electronic circuits. Objective of computer organisation is to know how Computer Systems work & its basic principles, how I/O devices are being accessed and its principles etc.

Course Outcome: Through this course, the student must be able to convert from one number system to another, work out problems of Boolean algebra, minimisation problems etc. The student must also learn to differentiate between the combinational and sequential circuits and design simple circuits. The students also will be exposed to computer organization based concepts for the future knowledge outcome of Computer Architecture offered in next semester. The students will be able to understand different instruction formats, instruction sets, I/O mechanism and other hardware details.

Module – 1: [**3L**]
Introduction, concepts and laws of Boolean algebra [1L], Boolean functions and Representation in SOP and POS forms [1L], Minterm and maxterm , Minimization of logic expressions by Karnaugh Map [1L]

Module – 2: [**7L**]
Combinational circuits:
Adder and Subtractor (half-full adder & subtractor) [2L],Carry look ahead adder and Parity Generator[1L], Encoder, Decoder, Multiplexer [2L], De-Multiplexer ,Comparator[[1L], Basic Concepts of A/D and D/A converters[1L]

Module – 3: [**8L**]
Sequential Circuits:
Basic Flip-flop- SR, JK, D, T and JK Master-slave Flip Flops [3L], Registers (SISO, SIPO, PIPO, PISO) [2L]
Ring counter, Johnson counter [1L], Basic concept of Synchronous and Asynchronous counters [1L], Design of Modulo-N Counter [1L],

Module – 4: [9L]
Stored program concept-Von Neumann and Harvard architecture [1L]
Introduction to CPU and concepts of ALU [2L], Instruction format and Instruction Cycle [1L], Addressing Modes [1L]
Fixed-point multiplication - Booth's algorithm. [1L], Fixed-point division - Restoring and non-restoring algorithms. [1L]
Floating-point number representation- IEEE 754 format and Floating-point arithmetic operation [2L]

Module – 5: [**4L**]
Introduction to memory-RAM and ROM [2L], Register transfer, memory transfer, Tri-state bus buffer [1L], Microprogrammed and hardwired control unit [1L]

Module – 6: [5L]
Introduction to I/O operations [1L], Synchronous and asynchronous transfer [1L], Modes of transfer [1L], Bus Arbitration [1L], Input-output processor [1L]

CODES	DESCRIPTIONS
CS301.1	Realize basic gate operations and laws Boolean algebra.
CS301.2	Understand basic structure of digital computer, stored program concept and different arithmetic and control unit operations.

CO/PO Mapping

(S/M/W indicates strength of correlation) S-Strong, M-Medium, W-Weak

	Programme Outcomes(POs)											
COs	**PO1 K=3**	**PO2 K=4**	**PO3 K=5**	**PO4 K=6**	**PO5 K=6**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1 K=2	**S(1)**	**M(3)**										
CO2 K=2	**S(1)**	**S(0)**		**M(4)**			**M**					
CO3 K=2	**S(1)**	**S(2)**										
CO4 K=3			**S(1)**	**S(2)**	**S(1)**				**M**			
CO5 K=2	**S(2)**	**M(3)**				**M**			**M**		**M**	

CS301.3	Understand basic structure of different combinational circuits- multiplexer, decoder, encoder etc.
CS301.4	Perform different operations with sequential circuits.
CS301.5	Understand memory and I/O operations.

Text Book:

David A. Patterson and John L. Hennessy- Computer Organization and Design: The Hardware/Software Interface

Morries Mano- Digital Logic Design- PHI

Reference Book:

Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,

William Stallings, Computer Organization and Architecture: Designing for Performance

Paper Name: Digital Electronics and Computer Organization
Paper Code: CS301
Contact Hours/Week: 3
Credit: 3
Total Contact Hours: 36

Course Objective: Objective of digital electronics is to acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronics circuits, to prepare students to perform the analysis and design of various digital electronic circuits. Objective of computer organisation is to know how Computer Systems work & its basic principles, how I/O devices are being accessed and its principles etc.

Course Outcome: Through this course, the student must be able to convert from one number system to another, work out problems of Boolean algebra, minimisation problems etc. The student must also learn to differentiate between the combinational and sequential circuits and design simple circuits. The students also will be exposed to computer organization based concepts for the future knowledge outcome of Computer Architecture offered in next semester. The students will be able to understand different instruction formats, instruction sets, I/O mechanism and other hardware details.

Module – 1: [**3L**]

Introduction, concepts and laws of Boolean algebra [1L], Boolean functions and Representation in SOP and POS forms [1L], Minterm and maxterm , Minimization of logic expressions by Karnaugh Map [1L]

Module – 2: [**7L**]
Combinational circuits:
Adder and Subtractor (half-full adder & subtractor) [2L],Carry look ahead adder and Parity Generator[1L], Encoder, Decoder, Multiplexer [2L], De-Multiplexer ,Comparator[[1L], Basic Concepts of A/D and D/A converters[1L]

Module – 3: [**8L**]
Sequential Circuits:

Basic Flip-flop- SR, JK, D, T and JK Master-slave Flip Flops [3L], Registers (SISO, SIPO, PIPO, PISO) [2L]
Ring counter, Johnson counter [1L], Basic concept of Synchronous and Asynchronous counters [1L], Design of Modulo-N Counter [1L],

Module – 4: [9L]
Stored program concept-Von Neumann and Harvard architecture [1L]
Introduction to CPU and concepts of ALU [2L], Instruction format and Instruction Cycle [1L], Addressing Modes [1L]
Fixed-point multiplication - Booth's algorithm. [1L], Fixed-point division - Restoring and non-restoring algorithms. [1L]
Floating-point number representation- IEEE 754 format and Floating-point arithmetic operation [2L]

Module – 5: [**4L**]
Introduction to memory-RAM and ROM [2L], Register transfer, memory transfer, Tri-state bus buffer [1L], Microprogrammed and hardwired control unit [1L]

Module – 6: [5L]
Introduction to I/O operations [1L], Synchronous and asynchronous transfer [1L], Modes of transfer [1L], Bus Arbitration [1L], Input-output processor [1L]

Text Book:
David A. Patterson and John L. Hennessy- Computer Organization and Design: The Hardware/Software Interface
Morries Mano- Digital Logic Design- PHI

Reference Book:
Hayes J. P., "Computer Architecture & Organisation", McGraw Hill,
William Stallings, Computer Organization and Architecture: Designing for Performance

Paper Name:Data Structures

Paper Code: CS302

Contact Hours/Week: 3L
Credits: 3

Allotted Lectures: 36L

Prerequisite:

1. Familiarity with the fundamentals of C or other programming language
2. A solid background in mathematics, including probability, set theory.

Course Objective(s)

- To learn the basics of abstract data types.
- To learn the principles of linear and nonlinear data structures.
- To build an application using sorting and searching.

Course Outcome(s)

On completion of the course students will be able to

- Differentiate how the choices of data structure & algorithm methods impact the performance of program.
- Solve problems based upon different data structure & also write programs.
- Identify appropriate data structure & algorithmic methods in solving problem.
- Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing
- Compare and contrast the benefits of dynamic and static data structures implementations.

Module I: Linear Data Structure [10L]

Introduction (2L):

Concepts of data structures: a) Data and data structure b) Abstract Data Type and Data Type.

Algorithms and programs, basic idea of pseudo-code (1L)

Algorithm efficiency and analysis, time and space analysis of algorithms – order notations (1L)

Array (2L):

Different representations – row major, column major (1L)

Sparse matrix - its implementation and usage, Array representation of polynomials (1L)

Linked List (6L):

Singly linked list – operations, Doubly linked list – operations (4L)

Circular linked list – operations, Linked list representation of polynomial and applications (2L)

Module II: Linear Data Structure [6L]

Stack and Queue (4L):

Stack and its implementations (using array and linked list) (1L)

Applications (infix to Postfix, Postfix Evaluation) (1L)

Queue, circular queue, de-queue (1L)

Implementation of queue- linear and circular (using array and linked list) (1L)

Recursion (2L):

Principles of recursion - use of stack, tail recursion. (1L)

Applications - The Tower of Hanoi(1L)

Module III: Nonlinear Data structures [12L]

Trees (8L):

Basic terminologies, forest, tree representation (using array and linked list) (1L)

Binary trees - binary tree traversal (pre-, in-, post- order) (1L)

Threaded binary tree (1L)

Binary search tree- operations (creation, insertion, deletion, searching) (1L)

Concept of Max-Heap and Min-Heap (creation, deletion) (1L)

Height balanced binary tree – AVL tree (insertion with examples only) (1L)

Height balanced binary tree – AVL tree (deletion with examples only) (1L)

m –Way Search Tree, B Tree – operations (insertion, deletion with examples only) (1L)

Graphs (4L):

Graph theory review (1L)

Graph traversal and connectivity – Depth-first search (DFS), Breadth-first search (BFS) - concepts of edges used in DFS and BFS (tree-edge, back-edge, cross-edge, and forward-edge) (2L)

Minimal spanning tree – Prim's algorithm, Kruskal's algorithm (basic idea of greedy methods) (1L)

Module IV: Searching, Sorting [8L]

Sorting Algorithms (4L):

Bubble sort, Insertion sort, Selection sort – with notion of complexity (1L)

Quick sort, Merge sort – with complexity (2L)

Radix sort – with complexity (1L)

Searching (2L):

Sequential search – with complexity (1L)

Binary search, Interpolation Search– with complexity (1L)

Hashing (2L):

Introduction to Hashing and Hashing functions (1L)

Collision resolution techniques (1L)

Text books:

1. Data Structures Through 'C' Language by Samiran Chattopadhyay, Debabrata Ghosh Dastidar, Matangini Chattopadhyay, Edition: 2001, BPB Publications

2. Fundamentals of Data Structures of C by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed 2nd Edition, Universities Press

Recommended books:

1. Data Structures, Algorithms, and Software Principles in C by Thomas A. Standish, 1 Edition, Pearson
2. Data Structures by S. Lipschutz, Special Indian Edition, Tata McGraw Hill Education (India) Private Limited
3. Data Structures and Program Design In C by Robert L. Kruse, Bruce P. Leung 2nd Edition, Pearson
4. Data Structures in C by Aaron M. Tenenbaum, 1St Edition, Pearson

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS302.1	3	3	2	2	3	2	2	3	3	3	2	3
CS302.2	3	2	2	2	2	2	3	2	2	3	3	2
CS302.3	3	3	3	2	3	3	3	2	2	3	3	2
CS302.4	3	3	3	3	3	3	3	3	3	3	3	3
CS302.5	3	3	3	3	3	3	3	3	3	3	3	3
CS302	3	3	3	2	3	3	3	3	3	3	3	3

Paper Name: PHYSICS-II Lab **Paper Code:** PH 391 [for CSE & IT] **Semester:** 3rd
Duration: 3 Hours/Week* **Full Marks:** 100 **Credits:** 1.5
Teaching Scheme: **Practical: 3 hrs/week**

Examination Scheme (Practical): End Semester Exam: 60 Internal Assessment:40

***At least 7 experiments to be performed during the semester**

Experiments on Module 1: Quantum Mechanics-II (6L)

1. . To study current-voltage characteristics, load response, areal characteristics and spectral response of photo voltaic solar cells & measurement of maximum workable power.
2. Measurement of specific charge of electron using CRT.
3. Determination of band gap of a semiconductor.

Experiments on Module 3: Storage and display devices
4. Identification of various types of magnetic materials through the study of Hysteresis loop

Experiments on Module 4 –Polarization

5. To determine the angle of optical rotation of a polar solution using polarimeter

Experiments on Module 5 -Electricity magnetism

6. Study of dipolar magnetic field behavior.
7. Study of hysteresis curve of a ferromagnetic material using CRO.
8. Use of paramagnetic resonance and determination of Lande-g factor using ESR setup.
9. Measurement of Curie temperature of the given sample.
10. Determination of dielectric constant of given sample (frequency dependent).
11. Determination of Hall co-efficient of a semiconductor and measurement of Magnetoresistance of a given semiconductor
12. Study of transducer property: Determination of the thermo-electric power at a certain temperature of the given thermocouple.

In addition to regular 7 experiments it is **recommended that each student should carry out at least one experiment beyond the syllabus/one experiment as Innovative experiment.

Probable experiments beyond the syllabus:
1. Determination of thermal conductivity of a bad conductor by Lees and Chorlton's method.
2. Determination of thermal conductivity of a good conductor by Searle's mothod.

3. Study of I-V characteristics of a LED.
4. Study of I-V characteristics of a LDR

Paper Name: Digital Electronics and Computer Organization Lab
Paper Code: CS391
Contact Hours/Week: 3
Credit: 1.5

1. A) Realization of basic gates and universal gates.
   B) Realization of basic gates using universal gates.
2. Design a Half adder and Full Adder circuit using basic gates and verify its output.
3. Design a Half subtrator and Full Subtractor circuit using basic gates and verify its output
4. Design an Adder/Subtractor composite unit.
5. Design of a 'Carry-Look-Ahead' Adder circuit.
6. Realization of a)Encoder, b)Decoder c) Multiplexer , d) De-MUX , e)Comparator and their Truth Table verification.
7. Realization of RS / JK / D flipflops using logic gates.
8. Design of Shift Register using J-K / D Flip Flop.
9. Realization of Synchronous Up/Down counters.
10. Design of MOD- N Counter
11. Design a composite ALU for multi-bit arithmetic operation.
12. Design of RAM.

Paper Code: Data Structures Lab
Paper Code: CS392
Contact (Periods/Week): L-T-P=0-0-3
Contact Hours/Week: 3
Credit Point: 1.5
No. of Lab: 11

Perquisite

1. Computer Fundamentals and principal of computer programming Lab

Objectives:

- To write and execute programs in C to solve problems using data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.
- To write and execute write programs in C to implement various sorting and searching methods.

Outcomes:

CS392.1 Choose appropriate data structure as applied to specified problem definition.

CS392.2 Handle operations like searching, insertion, deletion, traversing mechanism on various data structures.

CS392.3 Have practical knowledge on the applications of data structures.

CS392.4 Able to store, manipulate and arrange data in an efficient manner.

CS392.5 Able to implement queue and stack using arrays and linked list. Implementation of queue, binary tree and binary search tree.

1. Write a C program to implement Single Link List
2. Write a C program to implement Double Link List
3. Write a C program to implement Single Circular Link List
4. Write a C program to implement Double Circular Link List
5. Write a C program to implement Polynomial addition and Polynomial multiplication using Linked List.
6. Write a C program to convert a given infix expression into its postfix Equivalent.
7. Write C programs to implement a queue ADT using i) array and ii) doubly linked list respectively.
8. Write a C program to implement Binary Search Tree (BST).
9. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:

a. Insertion sort
b. Merge sort

10. Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:
a. Quick sort
b. Selection sort

11. Write C programs for implementing the following searching methods:
a. Linear Search
b. Binary Search

Write a C program to implement all the functions of a dictionary (ADT) using hashing.

12. Write C programs for implementing the following graph traversal algorithms:
a. Depth first search
b. Breadth first search

Text Books:

1. Data Structures using C, R. Thareja, 2nd Edition, Oxford University Press.
2. Data Structures Using C E. Balagurusamy, Mcgraw Hill

Reference Books:

1. Data Structures in C by Aaron M. Tenenbaum, 1st Edition, Pearson
2. Data Structures Through 'C' Language by Samiran Chattopadhyay, Debabrata Ghosh Dastidar, Matangini Chattopadhyay, Edition: 2001, BPB Publications
3. Data structures using C, A.K.Sharma, 2nd Edition, Pearson
4. Fundamentals of Data Structures of C by Ellis Horowitz, Sartaj Sahni, Susan Anderson-freed 2nd Edition, Universities Press

CO	PO1	PO2	POP3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CS392.1	3	3	2	2	2	2	1	1		1		
CS392.2	3	2	2		2	2	1			1		2
CS392.3	2	1	1					1				
CS392.4	3	2		2		1	1		1		1	
CS392.5	1		2	1	2			1	1		1	2
CS392	3	2	2	2	2	2	1	1	1	1	1	2

Programming with C++ Lab
Code: CS393
Contact: 3P(1L+2P)
Credits: 1.5

Total contact hours: 33L

1. Introduction of UNIX/Linux Operating System which includes preliminary commands, start-up & shutdown methodology, file **[3P]**
2. Handling as well as introduction to editors like Vi editor, introduction to GNU C & C++ compiler, as well as introduction to GNU & GDB script. **[2P]**
3. Introduction to C++, basic loop control, executing programs. [2P]
4. Writing functions, selection statements, review of functions and parameters, command line arguments, recursion, I/O streams, arrays and string manipulation, pointers, structures & unions**. [6P]**
5. Object-Oriented Programming in C++, fundamentals of classes, constructors-destructors. **[2P]**
6. Dealing with member functions, operator overloading and polymorphism (both static & dynamic). [6P]
7. Dealing with inheritance, derived class handling.[2P]
8. Abstract class, virtual class, overriding, template class, name-space & exception handling. [6P]
9. Dynamic memory allocation, implementation of Linked Lists, using C++. [4P]

Note: GNU C++ can be used for the programming, since it is free and has no licensing anomaly

Text Books

1. The C++ Programming Language by Bjarne Stroustrup
   Addison-Wesley publisher
2. Object-Oriented Programming in C++ b by Robert Lafore
   Publisher: Sams

Reference Books

1. Object Oriented Programming with C++ by Balagurusamy
   McGraw Hill Education; Sixth edition

Debasree Mitra Ashifuddin Mondal