

CSE COURSE STRUCTURESEMESTER-I

SL. NO.	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
<b>THEORY</b>							
01.	HS101	ENGLISH FOR COMMUNICATION	2	1	0	3	2
02.	BS101	MATHEMATICS-I	3	1	0	4	3
03.	BS102	ENGINEERING PHYSICS-I	3	1	0	4	3
04.	BS103	ENGINEERING CHEMISTRY	3	1	0	4	3
05.	ES101	MECHANICAL SCIENCES-I	3	1	0	4	3
06.	ES102	BASIC ELECTRICAL ENGG.	3	1	0	4	3
<b>PRACTICAL</b>							
07.	BS112	PHYSICS LAB-I	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>2</b>
08.	BS113	CHEMISTRY LAB	0	0	3	3	2
09.	ES111	ENGG. WORKSHOP	0	0	4	4	3
10.	ES112	BASIC ELETRICAL ENGG. LAB	0	0	3	3	2
		TOTAL	17	06	13	36	26
11.	<b>MC101</b>	NSS	0	0	3	3	2

**SEMESTER-II**

SL. NO.	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
<b>THEORY</b>							
01.	BS204	MATHEMATICS-II	3	1	0	4	3
02.	BS205	ENGINEERING PHYSICS-II	3	1	0	4	3
03.	ES203	MECHANICAL SCIENCES-II	3	1	0	4	3
04.	ES204	BASIC ELECTRONICS ENGG.	3	1	0	4	3
05.	ES205	INTRODUCTION TO COMPUTER PROG.	3	1	0	4	3
<b>PRACTICAL</b>							
06.	BS215	PHYSICS LAB-II	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>2</b>
07.	ES213	ENGINEERING DRAWING & GRAPHICS	0	0	3	3	2
08.	ES214	BASIC ELECTRONICS ENGG. LAB	0	0	3	3	2
08.	ES215	COMPUTER PROG. LAB	0	0	3	3	2
09.	HS212	LANGUAGE LAB	0	0	3	3	2
		TOTAL	15	05	15	35	25
10.	MC202	ENVIRONMENTAL SCIENCES	3	0	0	3	3

**SEMESTER-III**

SL. NO.	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
THEORY							
01.	BS(CS)306	PROBABILITY AND STATISTICS	3	1	0	4	3
02.	CS 301	NUMERICAL METHODS	2	1	0	3	2
03.	CS302	DIGITAL LOGIC	3	1	0	4	3
04.	CS303	COMPUTER ORGANIZATION	3	1	0	4	3
05.	CS304	DATA STRUCTURE & ALGORITHM	3	1	0	4	3
PRACTICAL							
06.	CS391	NUMERICAL METHODS LAB	0	0	3	3	2
07.	CS392	DIGITAL LOGIC LAB	0	0	3	3	2
08.	CS393	COMPUTER ORGANIZATION LAB	0	0	3	3	2
09.	CS394	ALGORITHMS-I LAB	0	0	3	3	2
		TOTAL	14	5	12	31	22
10.	MC303	VALUE EDUCATION, HUMAN RIGHTS	3	0	0	3	3

### SEMESTER-IV

SL. NO.	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
<b>THEORY</b>							
01.	BS 407	ELEMENTARY BIOLOGY	3	0	0	3	3
02.	CS405	GRAPH THEORY & COMBINATORICS	3	1	0	4	3
03.	CS406	COMMUNICATION ENGINEERING	3	0	0	3	3
04.	CS407	MICROPROCESSOR & ITS INTERFACING	3	1	0	4	3
05.	CS408	FORMAL LANGUAGE & AUTOMATA THEORY	3	1	0	4	3
<b>PRACTICAL</b>							
06.	CS495	SOFTWARE TOOLS LAB	0	0	3	3	2
07.	CS496	COMMUNICATION ENGINEERING LAB	<b>0</b>	<b>0</b>	<b>3</b>	<b>3</b>	<b>2</b>
08.	CS497	MICROPROCESSOR LAB	0	0	3	3	2
09.	CS498	ALGORITHMS – II LAB	0	0	3	3	2
		TOTAL	15	3	12	30	23

**SEMESTER-V**

SL. NO.	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
<b>THEORY</b>							
01.	CS509	DATA BASE MANAGEMENT SYSTEMS	3	1	0	4	3
02.	CS510	COMPUTER ARCHITECTURE	3	1	0	4	3
03.	CS511	OPERATING SYSTEM	3	1	0	4	3
04.	CS512	OBJECT ORIENTED METHODOLOGIES	3	1	0	4	3
05.	PE(CS)501	A. ARTIFICIAL INTELLIGENCE B. IMAGE PROCESSING C. SOFT COMPUTING D. VLSI DESIGN & ALGORITHMS	3	0	0	3	3
<b>PRACTICAL</b>							
06.	CS599	DATA BASE MANAGEMENT SYSTEMS LAB	0	0	3	3	2
07.	CS591	OPERATING SYSTEM LAB	0	0	3	3	2
08.	CS592	PROGRAMME PRACTICES LAB USING C++	0	0	3	3	2
09.	PE(CS)591	A. ARTIFICIAL INTELLIGENCE LAB B. IMAGE PROCESSING LAB C. SOFT COMPUTING LAB D. VLSI LAB	0	0	3	3	2
		TOTAL	15	4	12	31	23

**SEMESTER-VI**

SL. NO.	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
<b>THEORY</b>							
01.	HS(CS)603	MANAGEMENT PRINCIPLES AND PRACTICES	3	0	0	3	2
02.	CS613	COMPUTER NETWORK	3	1	0	4	3
03.	CS614	SOFTWARE ENGINEERING	3	1	0	4	3
04.	CS615	DESIGN & ANALYSIS OF ALGORITHM	3	1	0	4	3
05.	CS616	COMPILER DESIGN	3	1	0	4	3
<b>PRACTICAL</b>							
06.	CS693	COMPUTER NETWORK LAB	0	0	3	3	2
07.	CS694	SOFTWARE ENGINEERING LAB	0	0	3	3	2
08.	CS695	JAVA PROGRAMMING LAB	0	0	3	3	2
09.	CS696	SEMINAR ON PROPOSED PROJECT	0	0	3	3	2
		TOTAL	15	4	12	31	22
10.	MC604	TECHNICAL COMMUNICATION AND SOFT SKILLS	0	0	3	3	3

## SEMESTER-VII

SL. NO.	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
<b>THEORY</b>							
01.	PE(CS)702	A. INTERNET & WEB PROGRAMMING B. SYSTEM SOFTWARE & ADMINISTRATION C. MULTIMEDIA COMPUTING D. E-COMMERCE	3	0	0	3	3
02.	PE(CS)703	A. DISTRIBUTED COMPUTING SYSTEMS B. CLOUD COMPUTING C. NETWORKING APPLICATIONS & SERVICES D. DATA WAREHOUSING AND DATA MINING E. SENSOR NETWORKS F. BIO-MEDICAL ENGINEERING G. COMPUTATIONAL GEOMETRY	3	0	0	3	3
03.	PE(CS)704	A. INFORMATION & CODING THEORY B. ERP C. COMPUTER GRAPHICS AND VISUALIZATION D. SIMULATION & MODELLING E. EMBEDDED SYSTEMS	3	0	0	3	3
03.	OE(CS)701	A. CIRCUIT THEORY & NETWORK B. DIGITAL SIGNAL PROCESSING C. INDUSTRIAL CONTROL SYSTEMS E. ENGINEERING SYSTEM ANALYSIS & DESIGN	3	1	0	4	3
<b>PRACTICAL</b>							
05.	OE(CS)792	A. WEB PROGRAMMING LAB B. SYSTEM ADMINISTRATION LAB C. MULTIMEDIA LAB D. E-COMMERCE LAB	0	0	3	3	2
06.	OE(CS)791	A. CIRCUIT THEORY & NETWORK LAB B. DIGITAL SIGNAL PROCESSING LAB C. CONTROL SYSTEMS LAB E. ENGINEERING SYSTEM ANALYSIS & DESIGN LAB					
07.	HS714	GROUP DISCUSSION	0	0	2	2	2
08.	CS720	INDUSTRIAL TRAINING (4 WEEKS AFTER 6 <sup>TH</sup> SEM)	0	0	0	0	2
09.	CS721	PROJECT PART - I	0	0	6	6	3
		TOTAL	12	2	14	28	24

**SEMESTER-VIII**

SL. NO	PAPER CODE	PAPER NAME	L	T	P	CONTACT HRS./WEEK	CREDIT
<b>THEORY</b>							
01.	PE(CS)805	A. MOBILE COMPUTING B. ADVANCED WEB TECHNOLOGY C. CRYPTOGRAPHY & INFORMATION SECURITY D. PATTERN RECOGNITION E. NATURAL LANGUAGE PROCESSING F. COMPUTER VISION G. GIS & REMOTE SENSING	3	0	0	3	3
02.	OE(CS)802	A. PROJECT MANAGEMENT B. ROBOTICS C. REAL TIME OPERATING SYSTEMS D. KNOWLEDGE MANAGEMENT E. CYBER LAW & SECURITY POLICY F. OPTICAL NETWORKING	3	0	0	3	3
03.	OE(CS)803	A. OPERATION RESEARCH B. HUMAN RESOURCE MANAGEMENT C. GAME THEORY & ENGG APPLICATIONS D. ENGG SYSTEM DESIGN OPTIMIZATION E. FINANCIAL MANAGEMENT	3	0	0	3	3
<b>PRACTICAL</b>							
04.	CS822	PROJECT PART -II	0	0	12	12	6
05.	CS823	COMPREHENSIVE VIVA VOCE	0	0	0	0	2
		TOTAL	09	0	12	21	17

## CSE 3rd sem detail syllabus

**Subject Name: DIGITAL LOGIC**

**Code: CS 302**

**Contacts: 3L + 1T = 4**

**Credits: 3**

### **Module - 1: [8L]**

**Number Systems , Boolean Algebra & Logic Gates:** Binary numbers & Boolean algebra , Venn diagram, Logic gates, Truth Tables and function minimization using algebraic method, Karnaugh map, Quine- Mcclusky method; BCD, ASCII, EBDIC, Gray codes and their conversions, Signed binary number representation with 1's and 2's complement methods, Maxterm, Minterm, Representation in SOP and POS forms ; Realization of Boolean functions using NAND/NOR gates, two-level and multi-level logic circuit synthesis.

### **Module - 2: [10L]**

**Combinational circuits :** Adder and Subtractor circuits (half & full adder & subtractor); Encoder, Decoder, Comparator, Multiplexer, De-Multiplexer and Parity Generator and checker; ROM, PLA .

### **Module - 3: [10L]**

**Sequential Circuits:** Latch, Flip-flop. Design of Flip-flops with logic gates. Counters, Registers. Design and analysis of sequential circuits -Moore and Mealy model description, state diagram and state table – Minimization methods. Memory unit. Racing and Logic hazards. Implementation of hazard free logic circuit. asynchronous sequential circuit synthesis.

### **Module – 4: [10L]**

**Digital Integrated Circuits:** Diode as switch. Use of diodes in AND, OR Circuits . Transistor as a switch. RTL, DTL, TTL logic gate circuits. MOS as a switch. Basic MOS inverter. MOS and CMOS logic gates. Fan -in and Fan-out of logic gates, propagation delay, Tristate logic.

Textbooks:

1. Digital Logic Design- Morries Mano- PHI
2. Digital Electronics - Kharate - Oxford
3. Digital Electronics - Logic & Systems by 1.Bigmell & R.Donovan; Cambridge Learning.
4. Digital Logic and State Machine Design (3rd Edition) - D.J.Comer, OUP

Reference:

- 5.P.Raja- Digital Electronics- Scitech Publications
6. R.P.Jain-Modern Digital Electronics, 2/e , Me Graw Hill
- 7.H.Taub & D.Shilling, Digital Integrated Electronics- Mc Graw Hill.
- 8.D.Ray Chaudhuri- Digital Circuits-Vol-I & II, 2/e- Platinum Publishers
- 9.Tocci, Widmer, Moss- Digital Systems,9/e- Pearson
- 10.J.Bignell & R.Donovan-Digital Electronics-Sle- Cenage Learning.
- 11.Leach & Malvino-Digital Principles & Application, Sle, Me Graw Hill
12. Floyed & Jain- Digital Fundamentals-Pearson.

**Subject Name: DIGITAL LOGIC LAB**

**Code: CS 392**

**Contacts: 3P**

**Credits: 2**

**Logic family:** Implementation of OR and AND gates using diodes, Study on characteristics of DTL and TTL inverters using discrete components, Study on characteristics of TTL and CMOS gates. [12 P]

**Combinational logic circuits:** Design and implementation of combinational circuits such as, Adders, comparators, parity generator and checker. Implementation of Boolean functions using multiplexer and decoder/de-multiplexer. [ 12 P]

**Sequential circuits:** Study of latch and flip-flop, design of counters. [12 P]

**Subject Name: NUMERICAL METHODS**

**Code: CS301**

**Contacts: 2L+1T**

**Credits: 2**

**Approximation in numerical computation: [4 L]**

Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors.

**Interpolation: [6 L]**

Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation. Central difference interpolation formula – Stirling and Bessels interpolation.

**Numerical integration: [3 L]**

Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule. Expression for corresponding error terms.

**Numerical solution of a system of linear equations: [6L]**

Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.

**Numerical solution of Algebraic equation: [4 L]**

Bisection method, Regula-Falsi method, Newton-Raphson method.

**Numerical solution of ordinary differential equation: [6 L]**

Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.

**Text Books:**

1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar, & Jain: Numerical Methods (Problems and Solution).
5. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.
6. Balagurusamy: Numerical Methods, Scitech.

**References:**

1. Atkinson, Kendall E. Elementary Numerical Analysis New York, NY: John Wiley
2. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
3. Soumen Guha & Rajesh Srivastava: Numerical Methods, OUP.

4. Srimanta Pal: Numerical Methods, OUP.
5. Stoer, J. and Bulirsch, R. Introduction to Numerical Analysis New York, NY: Springer-Verlag,
6. Conte, Samuel D. and de Boor, Carl. Elementary Numerical Analysis: An Algorithmic Approach, New York, NY: McGraw-Hill,

**Subject Name: NUMERICAL METHODS LAB**

**Code : CS 391**

**Contacts : 3P**

**Credits : 2**

1. Assignments on Newton forward /backward, Lagrange's interpolation. [ 9 P]
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule. [ 9 P]
3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations. [ 6 P]
4. Assignments on numerical solution of Algebraic Equation by Bisection, Regular-falsi and Newton Raphson methods. [ 9 P]
5. Assignments on ordinary differential equation: Euler's and Runge-Kutta methods. [ 9 P]
6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica. [ 6 P]

**Subject Name: PROBABILITY AND STATISTICS**

**Code: BS(CS)306**

**Contacts: 3L +IT = 4**

**Credits: 3**

**Module I - Theory of Probability: [8 L]**

One dimensional random variable. Probability distributions-discrete and continuous. Expectation. Binomial, Poisson, Uniform, Exponential, Normal distributions and related problems.  $t$ ,  $\chi^2$  and F-distribution (Definition only). Transformation of random variables. Central Limit Theorem, Law of large numbers (statement only) and their applications. Tchebychev inequalities (statement only) and its application.

**Module II – Two Dimensional Distribution: [6 L]**

Two dimensional probability distributions. Discrete and continuous distributions in two dimensions. Uniform distribution and two dimensional normal distribution. Joint, marginal and conditional distributions .

**Module III - Sampling theory: [6 L]**

Random sampling: Parameter, Statistic and its Sampling distribution. Standard error of statistic. Sampling distribution of sample mean and variance in random sampling from a normal distribution (statement only) and related problems. Estimation of parameters: Unbiased and consistent estimators. Point estimation. Interval estimation. Maximum likelihood estimation of parameters (Binomial, Poisson and Normal). Confidence intervals and related problems.

#### **Module IV - Testing of Hypothesis: [8 L]**

Simple and Composite hypothesis. Critical region. Level of significance. Type I and Type II errors. One sample and two sample tests for means and proportions.  $\chi^2$  - test for goodness of fit.

Neyman-Pearson theorem (Statement only) and its application to normal population. Likelihood ratio testing and its application to normal population. Comparison of Binomial Populations; Normal Populations; Testing of Equality of Means;

#### **Module V - Linear Inference and Multivariate Analysis: [8L]**

Multiple Regression analysis, linear regression, curvilinear regression and orthogonal polynomials, discriminant analysis, canonical correlations, principal component analysis.

#### **Books:**

1. Banerjee A., De S.K. and Sen S.: Mathematical Probability, U.N. Dhur & Sons.
2. De S.K. and Sen S.: Mathematical Statistics, U.N. Dhur & Sons.
3. Gupta S. C and Kapoor V K: Fundamentals of Mathematical Statistics, Sultan Chand & Sons.
4. Das N.G.: Statistical Methods, TMH.
5. Spiegel M R., Schiller J.J. and Srinivasan R.A. : Probability and Statistics (Schaum's Outline Series), TMH.
6. Multivariate Data Analysis: [Joseph F. Hair](#), Rolph E. Anderson , Prentice Hall Higher Education, 2010.
7. Applied Multivariate Statistical Analysis: R. A. Johnson and D.W. Wichern, PHI.
8. Fundamentals of Statistics (Vol-1) ; A.M. Gun, M.K. Gupta and B. Dasgupta, World Press.
9. Probability and Statistics; D. Biswas, New Central Book Agency.
10. Probability, Statistics and Random Processes; T Veerarajan, Tata McGraw-Hill.

#### **Computer Organization**

**Code: CS303**

**Contacts: 3L +1T**

**Credits: 3**

#### **Introduction : [3 L]**

History of computing, von Neumann machine, Instruction and data, fixed-point and floating-point numbers, errors, IEEE standards

#### **Processor design: [7 L]**

Instruction Set Architecture-Instruction format, opcode optimization; operand addressing; Instruction implementation-data movement, branch control, logical, Input/output and debugging instructions; arithmetic instruction implementation—addition and subtraction, multiplication-division, 2's complement multiplication; Booth's algorithm—theory and examples; bit-pair algorithm; high performance arithmetic

#### **Control unit design: [ 8 L]**

hardwired control, micro-programmed control design – micro-instruction formats, control optimization;

#### **Memory subsystem: [9 L]**

Memory technology, memory interfacing, Memory hierarchy—introduction to virtual memory system; cache memory – performance, address mapping, content addressable memory (CAM)

**Peripherals: [7 L]**

Basic properties, bus architectures, interfacing of I/O devices, data transfer schemes –programmed I/O, DMA, mass storage, RAID

**Pipelining: [6 L]**

pipelining datapath and instructions, speed up, CPI, latency; linear / non-linear pipeline–reservation table, MAL; super-pipelined and super-scalar processors.

**Text Book:**

1. Mano, M.M., “Computer System Architecture”, PHI.
2. BehroozParhami “ Computer Architecture”, Oxford University Press

**Reference Book:**

1. Hayes J. P., “Computer Architecture & Organisation”, McGraw Hill,
2. Hamacher, “Computer Organisation”, McGraw Hill,
3. N. senthil Kumar, M. Saravanan, S. Jeevananthan, “Microprocessors and Microcontrollers” OUP
4. Chaudhuri P. Pal, “Computer Organisation & Design”, PHI,
5. P N Basu- “Computer Organization & Architecture” , Vikas Pub

**Computer Organization Lab****Code: CS393****Contacts: 3P****Credits: 2**

1. Design of adders [6 P]
2. Memory module design [ 9 P]
3. Implementation of simple memory test logic (such as March test) [ 6 P]
4. Realization of data transfer among CPU registers, Main memory and External sources [9 P]
5. Swapping of registers' contents [ 6 P]
6. Control design [ 9 P]

## **Data Structure & Algorithm**

**Code: CS304**

**Contacts: 3L +1T**

**Credits: 3**

*(Note: examples should be given using pseudo codes; actual codes have to be developed in the practical classes. Preliminary knowledge of coding and executing some simple programs is required)*

The problem solving process: algorithms and data structure; role of data structure in algorithm efficiency; example: design of an array without and with distinct subscript. [1]

Introduction to algorithms: definition, properties, types (only brute force, divide and conquer, greedy, iterative improvement and recursive); pseudo codes. Time and space complexity: asymptotic notations- Big-Oh and big Theta; properties, simple examples. [2]

Recurrence relations: substitution method. Example- development of recurrence relations from simple pseudo codes. [1]

Abstract Data Type (ADT): concepts of data types, ADT and data structure. Typical ADT: integer, array and list; primitive data types. [1]

Linear and non-linear data structures-definition and examples. [1]

Arrays as data structure: memory representation and implicit addressing; 1D and 2D, row major and column major representations, address translation; language dependence. Applications: polynomial and matrix representation. [2]

Linked Lists: explicit addressing in a node (pointer/reference); singly linked list, circular linked list, doubly linked list. Applications: polynomial (up to three variables) and matrix representation- advantages and disadvantages w.r.t array based representation; large integer arithmetic. Multi-list sparse matrices. [3]

Stack: definition, implementation with arrays and linked lists. infix, postfix and prefix notations- conversion and evaluation; palindromes. Use of stack in nested and recursive call of functions, differences between recursion and iteration, tail recursion. Application - The Tower of Brahma problem. [3]

Queue: circular queue, dequeue. Implementation of queue - linear and circular (using array and linked list); Application: well-formed parenthesis checking. [2]

Trees: basic terminologies, recursive nature; types: free tree, ordered and rooted tree, forest. Tree representation with array and linked list. Binary trees: definition; node, path, level, height; skewed and complete binary tree; extended binary tree. Basic properties of binary trees : height of a CBT, maximum and minimum number of nodes, degree of nodes and their relationship, number of distinct binary trees with n nodes (statement only). Binary tree traversal (pre-, in-, post- level-order); threaded binary tree (left, right, full) - non-recursive traversal using threaded binary tree, advantage; expression tree. Application: Huffman's algorithm. [5]

Binary search tree: definition; operations (creation, insertion, deletion, searching). Height balanced binary tree – AVL tree and rotations for balancing, insertion and deletion of nodes (with examples only). Tries. Concept of balanced tree structures; B-tree. [3]

Graph: graph as: a mathematical structure, an ADT, a data structure. Representations of graphs in an algorithm - adjacency matrix, adjacency list, incidence matrix and incidence list; comparison. Graph traversal– DFS, BFS, and applications. Minimal spanning tree – Prim's and Kruskal's algorithm.<sup>1</sup> [5]

Sorting: inversion and unsortedness, definition. Classification - internal and external sorts; stability of a sorting algorithm. Sorting by comparison: calculation of lower bound; algorithms- Bubble sort, Insertion sort, Selection Sort, Quick sort, Merge Sort. Linear time sorting: Counting sort, Radix sort. Comparisons of different sorting algorithms.<sup>2</sup> [6]

Heap data structure: Binary heap (max and min). Use: priority queue. Heap sort.<sup>1</sup> [2]

Searching: sequential search using arrays and linked list.<sup>2</sup> Binary search (recursive and non-recursive) and comparison tree<sup>3</sup>; Interpolation search. Comparison of the three algorithms<sup>1</sup> [3]

Hashing: concept of key-to-address transformation, direct addressing, advantages and disadvantages: comparison with other search techniques. Hash functions- division remainder, multiplication, extraction, compression; brief comparison. Collision resolution techniques- open addressing (linear and quadratic probing), chaining; load factor and comparison<sup>1</sup>; applications. [3]

#### Notes:

<sup>1</sup> Statement of time complexities only.

<sup>2</sup> Derivation of worst case and average case time complexities.

<sup>3</sup> Derivation of worst case time complexity, and mention of average case time complexity.

#### Text books:

1. **D.E. Knuth:** *The Art of Computer Programming* (Vol. 1 & 3), Pearson, 1997.
2. **Horowitz, Sahni, Anderson-Freed:** *Fundamentals of Data Structures in C* (Second Edition), Universities Press, 2008.
3. **T.H. Cormen, C.E. Leiserson, R. Rivest and C. Stein:** *Introduction to Algorithms*, (Second/Third Edition), PHI, 2009.
4. **R. Sedgewick:** *Algorithms in C*, Pearson, 2004.

#### Reference book:

1. **Ronald L. Graham, Donald E. Knuth, and Oren Patashnik:** *Concrete Mathematics: A Foundation for Computer Science*. Addison-Wesley, 1988.

**Subject Name: ALGORITHMS-I LAB**

**Code: CS 394**

**Contacts: 3P**

**Credits: 2**

**1. Review of Introduction to Computing and Computing Practice:**

Assignments based on Array, etc. [6P]

**2. Assignments based on Stack and its Applications:** Parenthesis matching, Evaluation and Conversion of Expressions in Postfix notation, etc. [6P]

**3. Assignments on search algorithms (sequential, binary and interpolation) on ordered and/or unordered data. [3P]**

**4. Assignments on sorting algorithms (bubble sort, selection sort, merge sort, quick sort, etc.):** Implementation and performance comparisons. [3P]

**5. Assignments on queues (circular queue, priority queue):** Implementation and applications. [3P]

**6. Assignments on linked lists (linear, circular, doubly linked list, etc):** Implementation and applications. [6P]

**7. Assignments on tree (binary tree, binary search tree, arithmetic expression tree, AVL tree):** Implementation, creation, operations, applications, etc. [6P]

**8. Assignments on graph:** Representations, Implementations and Applications. [3P]