Central University of Himachal Pradesh
(Established under Central Universities Act 2009)
PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA – 176215, HIMACHAL PRADESH Website: www.cuhimachal.ac.in

Course Code: CSI422

Course Name: LAB- Data Structure & Algorithms

Credit Equivalent: 04 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Course Objectives: The course is designed

- **To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.**
- **To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity.**
- **To get a good understanding of applications of Data Structures.**
- **To develop a base for advanced computer science study.**

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. **Mid Term Examination: 25%**
2. **End Term Examination: 50%**
3. **Continuous Internal Assessment: 25%**
   - **i) Class participation 10%**
   - **ii) Class tests 10%**
   - **iii) Assignments 5%**

Course Contents:

Unit-I: (04 Hours)

Introduction: Basic Terminology, Data types and its classification, Array Definition, Representation and Analysis of Arrays, Single and Multidimensional Arrays, Address calculation, Linear Search, Binary Search of Array, Traversing , Insertion & deletion in array, Sparse Matrices, Strings.

Unit-II: (04 Hours)

Linked List : Traversing & Searching in Linked List, Insertion into linked list- at beginning of list & at given location, Deletion in linked list- from starting of list & given location of node, Header Linked List, two way List, Input & output restricted liked list, Circular Header Linked List.

Unit-III: (04 Hours)

Stack, Array Implementation of stack, Linked Representation of Stack, Conversion of Infix to Prefix and Postfix Expressions and Expression evaluation.

Queue, Array and linked implementation of queues, Circular queues, D-queues and Priority Queues.

Unit-IV: **(04 Hours)**

Trees: Array and Linked Representation of Binary trees, Traversing Binary trees, Binary Search Tree (BST), AVL Trees, B-trees.

Unit-V: **(04 Hours)**

Sorting: Insertion Sort, Bubble Sort, selection sort, Quick Sort, Merge Sort.

Prescribed Text Book:

- **Lipschutz, "Data structure (Schaum)", TMH**

Suggested Additional Reading:

1. **A.M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.**
2. **Data Structures Trembley and Sorenson, TMH Publications**
3. **Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., N Delhi.**
4. **R. Kruse et al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002**
5. **http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/data_str_algo/frameset.htm**
6. **"Data Structures: The Problem of Time Series Computing", John Henstridge ,** Journal of Applied Probability, **Vol. 23, Essays in Time Series and Allied Processes (1986), pp. 407-411 [http://www.jstor.org/]**
7. **"Internal Data Structures" Author(s): J. C. Gower and I. D. HillSource: Journal of the Royal Statistical Society. Series C (Applied Statistics), Vol. 20, No. 1(1971), pp. 32-45Published by: Wiley for the Royal Statistical SocietyStable URL: http://www.jstor.org/stable/2346629**

List of Experiments

Lab	Experiments
Lab-1	Linear Search, Binary Search of Array, Traversing of array
Lab-2	Insertion & deletion in array, Sparse Matrices, Strings.
Lab-3	Linked List : Traversing & Searching in Linked List,
Lab-4	Insertion into linked list- at beginning of list & at given location, Deletion in linked list- from starting of list & given location of node
Lab-5	Array Implementation of stack, Linked Representation of Stack
Lab-6	Conversion of Infix to Prefix and Postfix Expressions and Expression evaluation. Array and linked implementation of queues
Lab-7	Array and Linked Representation of Binary trees, Traversing Binary trees
Lab-8	Traversing Binary Search Tree (BST)
Lab-9	Insertion Sort, Bubble Sort, selection sort
Lab-10	Quick Sort, Merge Sort

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PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA – 176215, HIMACHAL PRADESH Website: www.cuhimachal.ac.in

Course Code: CSI420

Course Name: Data Structure & Algorithms

Credit Equivalent: 04 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Course Objectives: The course is designed

- **To develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.**
- **To be able to carry out the Analysis of various Algorithms for mainly Time and Space Complexity.**
- **To get a good understanding of applications of Data Structures.**
- **To develop a base for advanced computer science study.**

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

4. **Mid Term Examination: 25%**
5. **End Term Examination: 50%**
6. **Continuous Internal Assessment: 25%**
   - **i) Assignments 5%**
   - **ii) Class participation 5%**
   - **iii) Class tests 10%**
   - **iv) Seminars 5%**

Course Contents:

Unit-I: (08 Hours)

Introduction: Basic Terminology, Data types and its classification, Algorithm, complexity- space & time complexity ,complexity notations- big Oh, Omega, Theta.

Array Definition, Representation and Analysis of Arrays, Single and Multidimensional Arrays, Address calculation, Linear Search, Binary Search of Array, Traversing , Insertion & deletion in array, Sparse Matrices, Strings.

Unit-II: **(08 Hours)**

Linked List Introduction, Representation of linked list in to memory, Memory allocation - Garbage Collection, Traversing & Searching in Linked List, Insertion into linked list- at beginning of list & at given location, Deletion in linked list- from starting of list & given location of node, Header Linked List, two way List, Input & output restricted liked list, Circular Header Linked List, Representation of Polynomials using linked List .

Unit-III: **(08 Hours)**

Stack, Array Implementation of stack, Linked Representation of Stack, Application of stack: Conversion of Infix to Prefix and Postfix Expressions and Expression evaluation.

Queue, Array and linked implementation of queues, Circular queues, D-queues and Priority Queues.

Unit-IV: **(09 Hours)**

Trees: Basic terminology, Binary Trees, algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary trees, Traversing Binary trees, Threaded Binary trees, Binary Search Tree (BST), AVL Trees, B-trees.

Graphs: Introduction, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees.

Unit-V: **(07 Hours)**

Internal and External sorting, Insertion Sort, Bubble Sort, selection sort, Quick Sort, Merge Sort, Radix sort.

Searching & Hashing: Sequential search, binary search, Hash Table, Hash Functions, Collision Resolution Strategies.

Prescribed Text Book:

8. **Lipschutz, "Data structure (Schaum)", TMH**
9. **Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., N Delhi.**

Suggested Additional Reading:

1. **A.M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.**
2. **Data Structures Trembley and Sorenson, TMH Publications**
3. **R. Kruse et al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002**
4. **http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/data_str_algo/frameset.htm**
5. **"Data Structures: The Problem of Time Series Computing", John Henstridge ,** Journal of Applied Probability, **Vol. 23, Essays in Time Series and Allied Processes (1986), pp. 407-411 [http://www.jstor.org/]**
6. **"Internal Data Structures" Author(s): J. C. Gower and I. D. HillSource: Journal of the Royal Statistical Society. Series C (Applied Statistics), Vol. 20, No. 1(1971), pp. 32-45Published by: Wiley for the Royal Statistical SocietyStable URL: http://www.jstor.org/stable/2346629**

LECTURE PLAN

Lectures	Topics	Prescribed Text Book	Chapter No.
Lecture-1	Introduction: Basic Terminology, Data types and its classification. Introduction of Algorithm.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-1 &2
Lecture-2	Complexity of an algorithm, Time & Space Complexity. Asymptotic Notation, Big Oh, Omega, Theta, Little Oh & Little Omega.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-1 &2
Lecture-3	Introduction to Data Structures, Basic operations, Arrays, Address Calculation of 1- dimension array.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-1 &4
Lecture-4	Traversing, Insertion, Deletion operation in array.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-4
Lecture-5	Linear Search, Binary Search of Array.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-4
Lecture-6	Two dimensional array, Memory representation of Two dimensional array.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-4
Lecture-7	Addition, Multiplication & Transpose of Matrix. Sparse matrices.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-4
Lecture-8	Strings - representation, String operations – strcpy, strcmp, strlen etc.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-3
Lecture-9	Linked List Introduction, Representation of linked list in to memory.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-10	Memory allocation -Garbage Collection.Traversing & Searching in Linked List.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-11	Insertion into linked list- at beginning of list & at given location.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-12	Deletion in linked list- from starting of list & given location of node.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-13	Header Linked List, two way List, Input & output restricted liked list.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-14	Circular Header Linked List, Representation of Polynomials using linked List .	Lipschutz, "Data structure (Schaum)", TMH	Chapter-5
Lecture-15	Stack Introduction, array representation of Stack, Linked list representation of Stack.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-16	Insertion (Push) into Stack, Deletion operation (POP) into stack.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-17	Recursion, Implementation of recursive procedure by stack.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6
Lecture-18	Polish, Infix & Reverse polish expression, Evaluation of postfix expression using stack.	Lipschutz, "Data structure (Schaum)", TMH	Chapter-6

CENTRAL UNIVERSITY OF HIMACHAL PRADESH

[ESTABLISHED UNDER THE CENTRAL UNIVERSITIES ACT 2009]

PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA - 176215 (HP)

www.cuhimachal.ac.in

Course Code: CSI502

Course Name: Software Engineering

Credit Equivalent: 4 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual / group work; obligatory / optional work placement; literature survey / library work; data collection / field work; writing of papers / projects / dissertation / thesis; seminars, etc.)

Course Objectives: The course is designed

- To introduce the methodologies involved in the development.
- To be aware of different life cycle models.
- To be aware of Architectural and detailed design methods.
- To study the implementation, testing strategies, Verification and Validation techniques.
- To study the project planning and management.

Attendance Requirement:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - i) Assignment 15%
   - ii) Class participation 5%
   - ii) Class tests 5%

Course Contents:

Unit-I:

Software: Software Hardware relationship, History and evolution of software, Programming Languages, Software platform, Software components, Features of Software, Software categories; Software Engineering Fundamentals: Software Engineering, Software Characteristics and Application; Software processes: Process and project; Software development process models: Water fall model, Prototyping, Incremental & Spiral model, 4th Generation Techniques; Software Project Management: Responsibilities of a software project manager, Project Planning, Metrics for project size estimation; Empirical Estimation Models: COCOMO Model, Project Scheduling.

Unit-II:

Software Requirements Analysis and Specification: Requirement gathering and analysis, Requirement Specification, Characteristics of an SRS, Organisation of the SRS document; System analysis tools and techniques: Data Flow Diagrams, Entity Relationship Diagrams; System Design: Design concepts, Coupling, Cohesion, User interface design, Characteristics of a good user interface.

Unit-III:

Software Quality Assurance: Quality concepts, Quality control, Quality assurance, SQA activities; Software reliability; Introduction to software coding; Software testing fundamentals: Testing objectives, Testing Principles, Test case design.

Unit-IV:

White Box testing: Basis Path Testing; Black Box testing: Methods, Equivalent class partitioning, Boundary value analysis, Cause effect graphing; Software Testing Strategies; Unit Testing, Integration Testing, Regression Testing, Smoke Testing, Validation Testing, Alpha and Beta Testing; System Testing: Recovering Testing, Security Testing, Performance Testing, Stress Testing; Debugging: Techniques, Strategies.

Unit-V:

Computer Aided Software Engineering: CASE and its scope, Benefits of CASE, CASE support in software life cycle; Software Maintenance: Objective, Types- Corrective maintenance, Adaptive maintenance, Perfective maintenance; Software Reuse: Basic issues in any reuse program, Reuse approach.

Prescribed Text Book:

1. Roger S. Pressman, " Software Engineering- A Practitioner's Approach", Tata McGraw Hill
2. Pankaj Jalote's, " Software Engineering", Wiley India

Suggested Additional Reading:

1. Rajib Mall, "Fundamentals of Software Engineering", PHI Learning Pvt. Ltd.

LECTURE PLAN

Lectures	Topics	Prescribed Text Book	Chapter No.
Lecture-1	Software : Hardware relationship, History and evolution of software	Book-1	Chapter-1
Lecture-2	Programming Languages, Software platform, Software components	Book-1	Chapter-1
Lecture-3	Features of Software, Software categories	Book-1	Chapter-1
Lecture-4	Software Engineering Fundamentals: Software Engineering	Book-2	Chapter-2
Lecture-5	Software Characteristics and Application	Book-1	Chapter-1
Lecture-6	Software processes: Process and project	Book-1	Chapter-
Lecture-7	Software development process models: Water fall model, Prototyping	Book-1	Chapter-2
Lecture-8	Incremental & Spiral model	Book-1	Chapter-2
Lecture-9	4th Generation Techniques; Software Project Management	Book-1	Chapter-2
Lecture-10	Responsibilities of a software project manager, Project Planning	Book-1	Chapter-3
Lecture-11	Metrics for project size estimation	Book-1	Chapter-3
Lecture-12	Empirical Estimation Models: COCOMO Model	Book-1	Chapter-3
Lecture-13	Project Scheduling	Book-1	Chapter-4
Lecture-14	Software Requirements Analysis and Specification	Book-1	Chapter-5
Lecture-15	Requirement gathering and analysis	Book-1	Chapter-5
Lecture-16	Requirement Specification, Characteristics of an SRS	Book-1	Chapter-5
Lecture-17	Organisation of the SRS document	Book-1	Chapter-6
Lecture-18	System analysis tools and techniques: Data Flow Diagrams, Entity Relationship Diagrams	Book-1	Chapter-6
Lecture-19	System Design: Design concepts, Coupling, Cohesion	Book-1	Chapter-6
Lecture-20	User interface design, Characteristics of a good user interface	Book-1	Chapter-7
Lecture-21	Software Quality Assurance: Quality concepts, Quality control	Book-1	Chapter-7
Lecture-22	Quality assurance, SQA activities	Book-1	Chapter-7
Lecture-23	Software reliability; Introduction to	Book-1	Chapter-7

	software coding		
Lecture-24	Software testing fundamentals	Book-1	Chapter-8
Lecture-25	Testing objectives, Testing Principles	Book-1	Chapter-9
Lecture-26	Test case design	Book-1	Chapter-9
Lecture-27	White Box testing: Basis Path Testing	Book-1	Chapter-9
Lecture-28	Black Box testing: Methods	Book-1	Chapter-11
Lecture-29	Equivalent class partitioning, Boundary value analysis	Book-1	Chapter-11
Lecture-30	Cause effect graphing; Software Testing Strategies	Book-1	Chapter-11
Lecture-31	Unit Testing, Integration Testing, Regression Testing	Book-1	Chapter-11
Lecture-32	Smoke Testing, Validation Testing, Alpha and Beta Testing	Book-1	Chapter-11
Lecture-33	System Testing: Recovering Testing, Security Testing, Performance Testing	Book-1	Chapter-12
Lecture-34	Stress Testing; Debugging: Techniques, Strategies	Book-1	Chapter-12
Lecture-35	Computer Aided Software Engineering: CASE and its scope	Book-1	Chapter-12
Lecture-36	Benefits of CASE	Book-1	Chapter-12
Lecture-37	CASE support in software life cycle	Book-1	Chapter-12
Lecture-38	Software Maintenance: Objective	Book-1	Chapter-12
Lecture-39	Software Maintenance Types- Corrective maintenance, Adaptive maintenance, Perfective maintenance	Book-1	Chapter-12
Lecture-40	Software Reuse: Basic issues in any reuse program, Reuse approach	Book-1	Chapter-12

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PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA – 176215, HIMACHAL PRADESH

Course Code: CSI 414

Course Name: Lab: Database Management System and C++.

Credits Equivalent: 2 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objectives: The course

- Help to learn how to create and maintain databases using SQL.
- Also help to learn how one can use OOPs concepts to create Software/application programs.

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%
   - Assignments: 10%
   - Lab Work: 5%
   - Test : 5%
   - Class Participation: 5%

Course Contents

C++

Unit I: (4 hours)

Operators and Statements in C++, Arrays, Functions, Pointers, Structures.

Unit II: (4 hours).

Classes and objects, Friend Functions, Constructor and Destructor, Operator Overloading, Inheritance.

Unit III: (3 hours)

Virtual Functions, Exception Handling, File handling.

DBMS (SQL)

Unit IV: (5 hours)

Expressions, Conditions and Operators, Creating and maintaining Tables, Creating views and Indexes, Queries, Clauses.

Unit V: (4 hours)

Functions, Joins, Transactions and database security, Advance topic in SQL.

Prescribed Text Books:

- Satish Ansani, Oracle database 11g,PHI publications.
- Robert Lafore, Object Oriented Programming in Turbo C++, Galgotia Publications.
- E. Balaguruswamy, Object Oriented Programming with C++, Tata McGraw Hill.

Suggested Additional Reading:

- Herbert Schildt, C++: The Complete Reference, TMH Publications.James Groff,
- Martin Gruber, Understanding SQL, BPB Publications.

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PO BOX: 21, DHARAMSHALA, DISTRICT KANGRA – 176215, HIMACHAL PRADESH
www.cuhimachal.ac.in

Course Code: CSI 409

Course Name: Database Management System and Distributed Databases.

Credits Equivalent: 4 Credits (One credit is equivalent to 10 hours of lectures / organised classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objectives: The course

- Provide an introduction to the management of database systems.
- Emphasizes the understanding of fundamentals of relational systems including data models, database architecture and database manipulations.
- Also help us to learn how to create and maintain a database.

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

4. Mid Term Examination: 25%
5. End Term Examination: 50%
6. Continuous Internal Assessment: 25%
    - Assignments: 10%
    - Presentation: 5%
    - Class Tests: 5%
    - Class Participation: 5%

Course contents

Unit I: **(8 hours)**

Introduction: Data processing versus data management , File oriented approach versus verses database oriented approach to data management, Advantages and Disadvantages of using DBMS, Entity types, Entity sets, Attributes, Keys, Relationships and their types, Weak entity types, Components of DBMS, Three-level architecture proposed for DBMS, Data Models classification.

Unit II: **(8 hours)**

Data Modeling using the Entity Relationship Model: ER model concepts, notation for ER diagram, mapping constraints, Generalization, aggregation, reduction of an ER diagrams to tables.

Relational data Model and Language: Relational data model concepts, integrity constraints: entity integrity, referential integrity, Keys constraints, Domain constraints, relational algebra, relational calculus, tuple and domain calculus.

Unit III: **(8 hours)**

SQL : Characteristics of SQL, Advantages of SQL, SQL data types and literals, Types of SQL commands, Expressions, Conditions and Operators, Tables, views and Indexes, Queries and sub queries, Clauses, Functions, Joins, Transactions and database security, triggers.

Unit IV: **(11 hours)**

Data Base Design & Normalization: Functional dependencies, normal forms, first, second, third normal forms, BCNF, inclusion dependencies, loss less join decompositions, normalization using FD, MVD, and JDs, alternative approaches to database design.

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, conflict & view serializable schedule, recoverability, Recovery from transaction failures, log based recovery, checkpoints, deadlock handling.

Concurrency Control Techniques: Concurrency control, locking Techniques for concurrency control, Time stamping protocols for concurrency control, validation based protocol, multiple granularity, Multi-version.

Database recovery techniques.

Database Security and Integrity: Threats and Defense mechanisms.

Unit V: **(5 hours)**

Distributed databases: Introduction, concept, Advantages and Disadvantages, Distributed database design, Types of distributed database systems, Query processing in distributed databases. Concurrency control and Recovery in distributed databases.

Prescribed Text Books:

1. Bipin C. Desai, “An introduction to Database Systems”, Galgotia Publication
2. Elmasri, Navathe, “Fundamentals Of Database Systems”, Addision Wesley

References

1. Date C J, “An Introduction To Database System”, Addision Wesley
2. Korth, Silbertz, Sudarshan, “Database Concepts”, McGraw Hill
3. Paul Beynon Davies, “Database Systems”, Palgrave Macmillan
4. Ramakrishnan, Gehrke, “Database Management System”, McGraw Hill