Courses offered by the Department
Spring Semester 2020(Jan- June 2020)

Name of School: School of Mathematics Computer & Information Sciences

Name of Department: Computer Science & Informatics

Name of Programme of Study: M.Sc. IT

Courses for Semester II (Second)

Sr. No.	Course Code	Course Name	Credits	Teacher
1.	CSI409A	DBMS	4	Manoj Dhiman
2.	CSI414A	LAB- DBMS	2	Manoj Dhiman & Keshav Rawat
3.	CSI420	Data Structure & Algorithms	4	Keshav Rawat
4.	CSI422	LAB- Data Structure & Algorithms	2	Sandeep , Keshav Rawat & Ajay Kumar
5.	CSI 502	Software Engineering	4	Ajay Kumar

Skill development Courses

Sr. No.	Course Code	Course Name	Credits	Teacher
1.	CSI449	LAB- PC package	2	Ajay Kumar

Human Development Courses

Sr. No.	Course Code	Course Name	Credits	Teacher
1.	CSI 429	IT tool for smart work	2	Keshav Rawat

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Course Code: CSI 409 A

Course Name: Database Management System

Credits Equivalent: 4 Credits (One credit is equivalent to 10 hours of lectures / organized 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.
- Help us to learn how to create and maintain databases.
- Help us to learn the concepts of transaction processing, concurrency control, recovery, protection, security and integrity.
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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: 20%

- 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: **(10 hours)**

File Organization: Serial Files, Sequential Files, Index-Sequential Files, Direct File, indexing Using Tree Structures.

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: **(10 hours)**

SQL: Introduction to SQL, Data types, classification of SQL commands (DDL, DML, DCL, TCL), Operators, integrity constraints, Built in Functions, sorting, joins, advanced queries using special operators, security.

Data Base Design & Normalization: Functional dependencies, normal forms.

Unit IV: **(12 hours)**

Transaction Processing Concepts: Transaction system, Testing of serializability, Serializability of schedules, 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: basic concepts, recovery techniques based on deferred update and immediate update, shadow paging.

Database Security and Integrity: Threats and Defense mechanisms.

Distributed databases: Introduction, Architecture, Advantages and Disadvantages, Distributed database design, Types of distributed database systems.

Prescribed Text Books:

1. Bipin C. Desai, "An introduction to Database Systems", Galgotia Publication
2. Elmasri, Navathe, "Fundamentals of Database Systems", Addision Wesley.
3. Satish Ansani, "Oracle database 11g",PHI publications.

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

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Course Code: CSI 414 A

Course Name: LAB- DBMS

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 helps to learn how to create and maintain databases using SQL and PL/SQL.

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%
    - Lab Assignments: 20%
    - Class Participation: 5%

Course Contents

Unit I: (5 hours)

- DDL.
- DML.
- DCL, TCL.
- Operators.
- Integrity constraints.

Unit II: (5 hours).

- Built in Functions.
- Clauses.
- Joins.
- Advanced queries using special operators.
- Security.

Unit III: (5 hours)

- PL/SQL introduction, conditional statements.
- Looping controls.
- Stored functions.
- Stored procedure.

Unit IV: (5 hours)

- Oracle packages.
- Exception handling in PL/SQL.
- Cursors.
- Triggers.

Prescribed Text Books:

1. Ivan Bayross,"SQL,PL/SQL, the programming language of Oracle", BPB Publication

Suggested Additional Reading:

- Martin Gruber, Understanding SQL, BPB Publications.
- Satish Ansani, "Oracle database 11g", PHI publications.
- MSQL Reference Manual.

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:

1. Mid Term Examination: 25%
2. End Term Examination: 50%
3. Continuous Internal Assessment: 25%

i)	Assignments	10%
ii)	Class participation	10%
iii)	Class tests	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:

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

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Course Code: CSI422

Course Name: LAB- Data Structure & Algorithms

Credit Equivalent: 02 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%

iv)	Class participation	10%
v)	Class tests	10%
vi)	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.

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

5. A.M. Tenenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd., New Delhi.
6. Data Structures Trembley and Sorenson, TMH Publications
7. Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., N Delhi.
8. R. Kruse et al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002
9. 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/23466

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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:

7. Mid Term Examination: 25%
8. End Term Examination: 50%
9. 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