राष्ट्रीय प्रौद्योगिकी संस्थान रायपुर
NATIONAL INSTITUTE OF TECHNOLOGY RAIPUR
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| National Institute of Technology Raipur | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Computer Application | | | | | | | | | | | | |
| Course of Study and Scheme of Examination | | | | | | | MCA 2nd Semester | | | | Branch:CA | |
| S. No. | Subject Code | Subject Name | Periods per Week | | | TA | Examination Scheme | | | | Total Marks | Credits |
| | | | L | T | P | | MSE/MTR | | ESE/ESVE | | | |
| | | | | | | | Theory | Prac. | Theory | Prac. | | |
| 1 | CA402101CA | Software Engineering | 3 | 1 | 0 | 20 | 30 | – | 50 | – | 100 | 4 |
| 2 | MA402002MA | Statistical Computing | 3 | 1 | 0 | 20 | 30 | – | 50 | – | 100 | 4 |
| 3 | CA402103CA | Data Structure | 3 | 1 | 0 | 20 | 30 | – | 50 | – | 100 | 4 |
| 4 | CA402104CA | Database Management System | 3 | 1 | 0 | 20 | 30 | – | 50 | – | 100 | 4 |
| 5 | CA402105CA | Theory of Computation | 3 | 1 | 0 | 20 | 30 | – | 50 | – | 100 | 4 |
| 6 | CA402401CA | Computer Lab-201 | 0 | 0 | 4 | 40 | – | 20 | – | 40 | 100 | 2 |
| 7 | CA402402CA | Computer Lab-202 | 0 | 0 | 4 | 40 | – | 20 | – | 40 | 100 | 2 |
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## Semester II

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|---|---|---|
| 1. | Department proposing the course | Department of Computer Applications |
| 2. | Course Title | Software Engineering |
| 3. | L-T-P Structure | 3-1-0 |
| 4. | Credits / # of period | 04/42 |
| 5. | Course number(Code) | |
| 6. | Status (Core/Elective) | Core |
| 7. | Pre-requisites (course no./title) | |
| 8. | Frequency of offer | |
| 9. | Course Objectives:<br>1. To impart concepts of software development life cycle.<br>2. To develop concepts of software design and development techniques.<br>3. To evolve concepts of project management techniques for a case study.<br>4. To elaborate concepts of testing methods. | |
| 10. | Course Syllabus:<br><br>**Unit-1**<br><br>**Introduction:** The Software and Software Engineering Problem, Approach and Goals of Software Engineering. Software Processes, Characteristics of a Software Process, Software Development Process Models, Other Software Processes.<br><br>**Unit-2**<br><br>**Software Requirement Analysis and Specification**: Software Requirement, Problem Analysis, Requirements Specification, Validation.<br><br>**Unit-3**<br><br>**Managing a Software Project:** Process Planning, Effort Estimation, Project Scheduling, Software Configuration Management Plans, Quality Assurance Plans, Risk Management, Function-Oriented Design Principles, Module-Level Concepts.<br><br>**Unit-4**<br><br>**Software Testing Techniques and Strategies:** Testing Fundamentals, White Box Testing, Black Box Testing, Software Testing Strategies, the Art of Debugging, Testing Tools. Software Re-engineering, Reverse Engineering, Restructuring Code, Forward Engineering, the Economics or Reengineering. Statistical Software Quality Assurance, Software Reliability, Statistical Testing, Software Quality Standards. Introduction to CASE Tools | |

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| 11. | **Text Books:**<br><br>1. Pressman Roger, Software Engineering: A Practitioner's Approach TMH, Delhi.<br>2. Jalote Pankaj: An Integrated Approach to software Engineering, Narosa, Delhi. |
| 12. | **Reference Books :**<br><br>1. R.E.Fairly, Software Engineering Concepts, Mc Graw Hill, Inc 1985.<br>2. Poyce, Software Project Management, Addison Wesley. |

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**Semester II**

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| 1. | Department proposing the course | Department of Mathematics |
| 2. | Course Title | Statistical Computing |
| 3. | L-T-P Structure | 3-1-0 |
| 4. | Credits / # of period | 4/40 |
| 5. | Course number(Code) | CMA22 |
| 6. | Status (Core/Elective) | Core |
| 7. | Pre-requisites (course no./title) | Undergraduates Mathematics and Statistics |
| 8. | Frequency of offer | Regular |
| 9. | **Course Objectives:**<br>To enable the students to apply the knowledge of Statistics in various fields:<br>1. Introduce the advantages and limitations of statistical methods, Method of least squares, regression analysis.<br>2. Introduce different probability distributions and their moment generating functions.<br>3. Introduce the techniques for hypothesis testing for different kind of samples.<br>4. Introduce the queuing theory and solve physical problems arising in management and industry. | |
| 10. | **Course Syllabus:**<br>**Unit - 1:- Basic Statistics**<br><br>Statistical Methods, Advantages and limitations of statistical methods, Frequency Distribution, Measures of central tendency, Measures of Dispersion, moments, Skewness and Kurtosis. Curve-fitting– Method of least squares, Karl Pearson's coefficient of Correlation, Correlation of ranks, Tied Ranks, Curve of regression, line of regression coefficients, Properties of regression coefficients and angle between two regression lines.<br><br>**Unit - 2:- Probability Distribution**<br><br>Random variable, Probability distribution function, Binomial distribution, Poisson distribution, Normal distribution, Rectangular distribution, Exponential distribution, Beta distribution, Gamma distribution, Erlang distribution; Moment generating functions of these distributions; Fitting of Binomial distribution, Poisson distribution, Normal distribution, Rectangular distribution and Exponential distribution.<br><br>**Unit - 3:- Sampling**<br><br>Types and Techniques of sampling, Test of significance for large samples, Comparison of two large samples, Sampling of variables, Sampling distribution, Standard and Probable errors, Test of significance based on chi square test, Z-test, t-test and F-test. | |

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| | **Unit - 4:-Queueing Theory**<br><br>Queue description, Characteristics of queueing system, Study steady-state solutions of M/M/1, M/M/1/K and M/M/c queuing models. |
| 11. | **Text Books:-**<br><br>**1.** Mathematical Statistics by Ray, Sharma, Chaudhary, Ram Prasad and Sons.<br>**2.** Statistical Analysis: A Computer Oriented Approach by Afifi, A.A.. Academic Press, New York 1979. |
| 12. | **Reference Books:-**<br><br>1. Introduction to Mathematical Statistics by Hogg, R.V. et al, American Publishing, New York 1980.<br>2. Probability and Statistics for Engineers and Scientists by R. E. Walpole, S. L. Myers, K. Ye, Pearson Prentice Hall. |

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## Semester II

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|---|---|---|
| 1. | Department proposing the course | MCA |
| 2. | Course Title | Data Structure |
| 3. | L-T-P Structure | 3-1-0 |
| 4. | Credits / # of period | 04/42 |
| 5. | Course number(Code) | |
| 6. | Status (Core/Elective) | Core |
| 7. | Pre-requisites (course no./title) | |
| 8. | Frequency of offer | |
| 9. | Course Objectives:<br>1. To equip students with the knowledge of variety of Data Structures.<br>2. To make them aware of how to use data structures effectively while designing algorithms.<br>3. To make aware of tree and searching, sorting problems. | |
| 10. | Course Syllabus:<br><br>**Unit-1**<br><br>**Introduction**: Introduction to Data Structures, Time Complexity Analysis of Algorithms with respect to Data Structures such as Heap, Priority Queue, Disjoint Data Structure.<br><br>**Unit-2**<br><br>**Linear Data Structures**: Arrays, Stacks, Queues, Linked Lists and their variations (Circular Linked List, Doubly Linked List), Implementation of Stack and Queue through Array and Linked List, Application of Stack such as Evaluation of Postfix and Prefix Expression, various Polish Notations (Prefix , Postfix And Infix), conversion from one to another using Stack, Polynomial Arithmetic : Addition, Subtraction.<br><br>**Unit-3**<br><br>**Non-linear Data Structures**:<br>Tree and its properties such as Height, depth, order, degree, parent & children relationship, Binary Tree-Various theorems, Complete Binary Tree, almost Complete Binary Tree; Binary Search Trees and Binary Tree Traversals; Threaded Binary Trees; Forest.<br><br>**Graph and its representations:** Adjacency Matrix, Adjacency List, Adjacency Multi-List; Graph Traversal Schemes - Depth First Search, Breadth First Search.<br><br>**Unit-4**<br><br>**Search Mechanisms and Sorting**: Linear Search, Binary Search, Hash Tables, Insertion Sort, Merge Sort, Heap Sort, Quick Sort, Trees, B-trees and B+ trees, AVL Tree. | |

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| 11. | **Text Books:**<br><br>1. Kruse R.L.: Data Structures and Program Design in C; PHI<br>2. Tennenbaum A.M. & others: Data Structures using C & C++; PHI |
| 12. | **Reference Books :**<br><br>1. Horowitz & Sawhaney: Fundamentals of Data Structures, Galgotia Publishers.<br>2. An introduction to Data Structures with Applications (Second edition), Tremblay and Sorenson, Tata MacGraw-hill.<br>3. Data Structures and Algorithms in Java (4th edition), Michael T. Goodrich and Roberto Tamassia, John Wiley and sons<br>4. A Practical Introduction to Data Structures and Algorithm Analysis, Clifford A Schaffer, Prentice Hall |

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## Semester II

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| 1. | Department proposing the course | Department of Computer Applications |
| 2. | Course Title | Database Management System |
| 3. | L-T-P Structure | 3-1-0 |
| 4. | Credits / # of period | 04/42 |
| 5. | Course number (Code) | |
| 6. | Status (Core/Elective) | Core |
| 7. | Pre-requisites(course no./title) | Basic data structures and their uses (lists, arrays).<br>Basic concepts of object-oriented programming. Contexts in which databases are used. |
| 8. | Frequency of offer | |
| 9. | Course Objectives :<br>1. To understand how to perform basic operations with DBMS<br>2. To develop database design process using ER diagram and Normalization.<br>3. To impart validation framework like integrity constraints, triggers and assertions.<br>4. To elaborate ACID properties and their implementation.<br>5. To implement Advanced concepts like Distributed database and Multimedia Database | |
| 10. | Course Syllabus:<br><br>**UNIT-1**<br><br>**Basic concepts:**<br>Database & Database Users. Characteristics and Advantages of DBMS, Data Models, Schemas & Instances. DBMS Architecture & Data Independence. System Architecture for DBMS and Data Dictionary, Database Users, Data Base languages & Interfaces. ER Model, Enhanced ER Model.<br><br>**UNIT-2**<br><br>**Relational Model, Languages & Systems:**<br>Relational Data Model Concepts and Constraints. Relational Algebra. Overview of Relational Calculus. SQL - A Relational Database Language. Data Definition commands, View and Queries, transaction commands, Specifying Constraints & Indexes in SQL.<br><br>**UNIT-3**<br><br>**Relational Data Base Design**:<br>Functional Dependencies & Normalization for Relational Databases. Informal design guidelines for relation schemas. Lossless join & Dependency preserving decomposition. Multi-valued dependencies join dependencies (4NF & 5NF), De-Normalization. | |

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| | **UNIT-4**<br><br>**Transactions, Concurrency Control, Recovery Techniques**:<br>ACID properties; transaction state; atomicity and durability; concurrent executions; Serializability, Storage Structure, Recovery Techniques, stable storage implementation, data access; recovery, Atomicity and Locking. |
| 11. | **Text Books:**<br><br>1. Elmsari and Navathe, "Fundamental of Database System", Addison Wesley. New York.<br>2. H. Korth & A. Silberschatz, "DATABASE SYSTEM CONCEPTS", TMH. |
| 12. | **Reference Books:**<br><br>1. Date. CJ, "An Introduction to Database System", Narosa Publishing House. New Delhi.<br>2. Desai, B, "An Introduction to Database Concepts", Galgotia Publications. New Delhi.<br>3. Ullman. J.D, "Principles of Database Systems", Galgotia Publications, New Delhi. |

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## Semester II

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|---|---|---|
| 1. | Department proposing the course | Computer Applications |
| 2. | Course Title | Theory of Computation |
| 3. | L-T-P Structure | 3-1-0 |
| 4. | Credits / # of period | 04/42 |
| 5. | Course number(Code) | |
| 6. | Status (Core/Elective) | Core |
| 7. | Pre-requisites (course no./title) | Elementary Mathematics |
| 8. | Frequency of offer | |
| 9. | Course Objectives:<br>1. Development of ability to understand computation models and the limitations of each computational model.<br>2. To develop the understanding of computational model applications to different problem areas.<br>3. To build strong analytical skills and intuition to solve problems in the areas of theory of computation.<br>4. To elaborate limitations of computational theory, i.e. the un-solvability of problems. | |
| 10. | Course Syllabus:<br><br>**Unit-1**<br><br>**Review of mathematical preliminaries:** Relations, Functions, Set Theory, Predicate and Prepositional Calculus, Principle of mathematical induction/strong mathematical induction. Formal Languages, Phrase structured grammar and their classification, Chomsky hierarchy, closure properties of families of languages. Regular grammar, properties of regular sets, finite automata NFA, DFA & 2DFA, FSM with output Determinism and Non determinism, FA minimization and related theorems<br><br>**Unit-2**<br><br>**Context- free languages**: parse trees and ambiguity, reduction of CFGS, Chomsky and Griebach normal forms, push - down Automata (PDA), non-determinism, CFLs and PDAs – Pumping lemma for context free languages, Closure and decision properties of CFLs.<br><br>**Unit-3**<br><br>**Concept of Linear Bounded Automata**: Context sensitive grammar and their equivalence; **Turing Machine(TM)**: unrestricted grammars and their equivalence with TM, determinism and non-determinism in TM, TM as acceptor/generator/algorithms and related theorems, Multi tape, multi-track TM, automata with two push down store and related theorems. | |

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| | **Unit-4**<br><br>**Introduction to Complexity theory:** Introduction to recursive function theory, Recursively enumerable sets, recursive sets, partial recursive sets, Russell's paradox, Church's hypothesis, post correspondence problem, un-decidability and some non-computable problems. |
| 11. | **Text Books:**<br><br>1. Introduction to the Theory of Computation, Michael Sipser.<br>2. Hopcropft and Ullman: Introduction to automata theory, Languages & Computation, Narosha Publication house. |
| 12. | **Reference Books:**<br><br>1. Martin John, "Introduction to languages and the theory of computation", TMH<br>2. LewishPapadimitra: theory of Computations, Prentice Hall of India, New Delhi.<br>3. Liu C.L.: Elements of Discrete Mathematics, McGraw Hill |

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## Computer Lab – 201 (Data Structure Lab Assignments)

**Implementation of program related to following**:

1. Programs based on applications of heap, priority queue and disjoint set data structure.
2. Programs based on linear data structure such as
   a) Implementation of various operations on linked list and doubly linked list;
   b) Implementation of stack and queue through array and linked list;
   c) Implementation of application of stack such as Evaluation of postfix and prefix expression , various polish notations (prefix, postfix and infix), conversion from one to another using stack;
   d) Implementation for polynomial Arithmetic: Addition, subtraction.
3. Programs based on non-linear data structure such as
   a) Implementation of various operations on binary search tree;
   b) Implementation of binary search tree traversal (inorder, preorder and postorder traversal);
   c) Implementation of Threaded binary trees;
   d) Implementation of AVL Tree;
   e) Implementation of creation of Graph through adjacency list and adjacency matrix;
   f) Implementation of graph traversal algorithms such as breadth first search (BFS) and depth first search (DFS) and also implementation of some applications of BFS and DFS.
4. Programs based on searching and sorting such as
   a) Implementation of Linear and Binary Search;
   b) Implementation of Insertion Sort, Heap Sort, Quick Sort, Merge Sort;
   c) Implementation of Tree.
5. Solve some optimization problems.

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**Computer Lab – 202 (DBMS Lab Assignments)**

1. Definition of Database (create, desc, alter, creating duplicate tables, constraints (primary key, foreign key, check, not null).

2. Creation and modification of Database (insert & interactive input, update, delete).

3. Retrieval of Database - Select: where, distinct, in, between-and, like, is null, group by-having, order by, column: (format, heading, justify, wrap trunc), nested queries: (any, all, in, not in, exists), joins: (simple, self-join, outer join, between joins).

4. Views (create, update and drop), sequences (create, alter and drop), Synonyms (create, drop), index (create, drop).

5. Execution of Transaction control commands (commit, rollback, save point).

6. Execution of Data control commands (grant, revoke).

7. Implementation of PL/SQL programming: (Exceptions, cursors, records, tables, triggers, procedures, functions).