Evaluation Scheme & Syllabus
for
MCA (Integrated)
3rd Year
On
Choice Based Credit System
(Effective from the Session: 2019-20)
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Subject Code</th>
<th>Subject Name</th>
<th>L-T-P</th>
<th>ESE Marks</th>
<th>Sessional Marks</th>
<th>Total</th>
<th>Credit</th>
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<td>Design &amp; Analysis of Algorithms</td>
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<td>5.</td>
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**SEMESTER-VI**

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**CT**: Class Test  
**TA**: Teacher Assessment  
**L/T/P**: Lecture/ Tutorial/ Practical
RCAI-501 : DESIGN & ANALYSIS OF ALGORITHMS

UNIT-I
Sorting in Linear Time: Counting sort, Radix Sort, Bucket Sort, Medians and order statistics.
Sorting in polynomial Time: Insertion sort, Merge sort, Heap sort, and Quick sort.

UNIT-II
Advanced Data Structure: Red Black Trees, Augmenting Data Structure, Binomial Heap, B-Tree, Fibonacci Heap, and Data Structure for Disjoint Sets, All kinds of Algorithms on these data structures, Dictionaries and priority Queues, mergeable heaps, concatenable queues.

UNIT-III

UNIT-IV

UNIT-V

References:
UNIT-I
Introduction: Features, basics of MATLAB, MATLAB workspace, MATLAB desktop, Creating and running scripting M-files, MATLAB as a calculator, Variables, Comments, Complex numbers, Arithmetic operations with scalars, Floating-point arithmetic, Mathematical functions, Elementary math built-in functions, Commands for managing variables, Relational and Logical operations, Applications in problem solving.

UNIT-II
Arrays and Matrices: One dimensional array, Array addressing and indexing, Array manipulation, Array sorting, Construction and manipulation of multi-dimensional arrays, Built-in functions for handling arrays, Matrix manipulation, Array and matrix operations,

Character strings: String construction, string manipulation and string functions.

UNIT-III
Control Flow: Theif, if-else construction, switch-case construction, for loop, while loop, nested loops. try-catch block.

UNIT-IV
Two-dimensional graphics: Basic plots, plot function, Style options, Multiple plots, Multiple figures, Overlay plots, Specialized 2-D plots.
Three-dimensional graphics: Line plots, mesh plots, Surface plots, Contour plots, Changing viewpoints, Specialized 3-D plots.

UNIT-V
Applications: Linear algebra- solving linear system, Finding Eigen values and Eigen vectors; Polynomials- roots, addition, multiplication, division, curve fitting; data analysis; Differentiation, Integration, Solving differential equations.

References:

UNIT-1
**Internet:** Introduction, Connecting to Internet: Telephone, Cable, Satellite connection, Choosing an ISP, Introduction to Internet services, E-Mail concepts, Sending and Receiving secure Email, Voice and Video Conferencing.

UNIT-2
**Core Java:** Introduction, Operator, Data type, Variable, Arrays, Control Statements, Methods & Classes, Inheritance, Package and Interface, Exception Handling, Multithread programming, I/O, Java Applet, String handling, Networking, Event handling, Introduction to AWT, AWT controls, Layout managers, Menus, Images, Graphics.

UNIT-3
**JDBC:** The connectivity Model, JDBC/ODBC Bridge, Java.sql package, connectivity to remote database, navigating through multiple rows retrieved from a database.

UNIT-4
**Java Beans:** Application Builder tools, The bean developer kit(BDK), JAR files, Introspection, Developing a simple bean, using Bound properties, The Java Beans API, Session Beans, Entity Beans, Introduction to Enterprise Java beans (EJB),
**RMI (Remote Method Invocation):** Introduction, a simple client-server application using RMI.

UNIT-5
**Java Servlets:** Servlet basics, Servlet API basic, Life cycle of a Servlet, Running Servlet, Debugging Servlets, Thread-safe Servlets, HTTP Redirects, Cookies, Introduction to Java Server pages (JSP).

**References:**

UNIT-I

UNIT-II

UNIT-III

UNIT-IV
Information Gathering: What Kind of Information do we need? Information about the firms, Information gathering tools, The art of Interviewing, Arranging the Interview, Guides to a Successful Interview, Types of Interviews and Questionnaires, The Structured and Unstructured Alternatives.

UNIT-V

References:
UNIT I

UNIT II
Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats - Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to ECommerce- Electronic Payment System, e-Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.

UNIT III

UNIT IV

References:
3. Dr. Surya Prakash Tripathi, RitendraGoyal, Praveen kumarShukla ,“Introduction to Information Security and Cyber Law” Willey Dreamtech Press.
6. Chander, Harish, “Cyber Laws And It Protection”, PHI Learning Private Limited, Delhi, India
1. WAP to demonstrate the use of elementary math built-in functions.
2. WAP to create a menu-driven program using switch-case statement.
3. WAP to demonstrate the use of various arithmetic and relational operators.
4. WAP to perform basic operations on an array.
5. WAP to perform basic operations on a matrix.
6. WAP to demonstrate the use of if and if-else statement.
7. WAP to demonstrate the use of while loop.
8. WAP to demonstrate the use of for loop.
9. WAP to demonstrate the use of nested loops.
10. WAP to sort a vector in ascending order.
11. WAP to swap elements of a vector using function.
12. WAP to create and access strings.
13. WAP to plot a 2-D plot with given specifications.
14. WAP to plot a 3-D plot with given specifications.
15. WAP to solve a given differential equation.
16. WAP to perform differentiation of given equation.
17. WAP to perform integration of given equation.
18. WAP to solve a given polynomial.
19. WAP to find Eigen values and Eigen vector.
20. WAP to demonstrate try-catch block.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.
RCAI-552: JAVA PROGRAMMING LAB

1. WAP to find the number of arguments provided at runtime.
2. WAP to calculate the simple interest by entering input by the user.
3. WAP to create a simple class to find out the area and perimeter of rectangle and box using super and this keyword.
4. WAP to design a class account using the inheritance and static that show all function of bank (withdrawal, deposit).
5. WAP to design a string class that performs String method (equal, reverse the string, change case).
6. WAP that import the user define package and access the member variable of classes that contained by package.
7. WAP to create a class component that shows controls and event handling on controls (Math calc).
8. WAP to draw a line, rectangle, oval using the graphics method.
9. WAP to create a Menu using the frame.
10. WAP to implement the Grid Layout and Card Layout.
11. WAP to create Frame to display the student information.
12. WAP to process student information and marks sheet using method overloading.
13. WAP to create an employee class and calculate the Gross salary of employee using inheritance.
14. WAP to illustrate the inheritance and use of the Super key word.
15. WAP to create a new txt file in the disk.
16. WAP to read string data from the File.
17. WAP to read data from the File.
18. WAP to create a Notepad using Swing.
19. WAP to create a calculator.
20. WAP to maintain student database using JDBC.

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Year-III (Semester-VI)

RCAI- 601: Database Management Systems

UNIT I

UNIT II

UNIT III

UNIT IV

UNIT V
CONCURRENCY CONTROL: Serial and Serializable Schedules-Conflict Serializability-Enforcing Serializability by Locks-Locking Systems with Several Lock Modes-Concurrency Control by Timestamps, validation.
TRANSACTION MANAGEMENT: Serializability and Recoverability-View Serializability-Resolving Deadlocks-Distributed Databases: Commit and Lock.

References :

UNIT-I
Graphs, sub-graphs, some basic properties, Walks, Path & circuits, Connected graphs, Disconnected graphs and component, Euler and Hamiltonian graphs, The traveling sales man problem, Various operation on graphs.

UNIT-II
Trees and fundamental circuits, distance diameters, radius and pendant vertices, rooted and binary trees, on counting trees, spanning trees, fundamental circuits, finding all spanning trees of a graph and a weighted graph, algorithms of primes, Kruskal’s and Dijkstra Algorithms.
Cut-sets and cut vertices, some properties, All cut sets in a graph, Fundamental circuit and cut sets, Connectivity and seperatability, Network flows, mincut theorems, Planar graphs, Combinatorial and geometric dual, Kuratowski to graph detection of planarity, Geometric dual, Some more criterion of planarity, Thickness and Crossings.

UNIT-III
Vector space of a graph and vectors, basis vector, cut set vector, circuit vector, circuit and cut set verses subspaces, orthogonal vectors and subspaces, incidence matrix of graph, sub matrices of A(G), circuit matrix, cut set matrix, path matrix and relationships among Af, Bf, and Cf, fundamental circuit matrix and rank of B, adjacency matrices, rank-nullity theorem.

UNIT-IV
Coloring and covering partitioning of graph, Chromatic number, Chromatic partitioning, Chromatic polynomials, Matching, covering, Four color problem.

UNIT-V
Directed graph, Types of directed graphs, Directed paths and connectedness, Euler digraph, Trees with directed edges, Fundamental circuit in digraph, Matrices A, B, C of digraph adjacency matrix of digraph, Enumeration and its types, Counting of labeled and unlabeled trees, Polya’s theorem, Graph enumeration with polyas theorem, Graph theoretic algorithm.

References:
1. Deo N., “Graph Theory”, PHI.
RCAI-603: ARTIFICIAL INTELLIGENCE

UNIT-I
Introduction: Introduction to Artificial Intelligence, Foundations and History of Artificial Intelligence, Applications of Artificial Intelligence, Intelligent Agents, Structure of Intelligent Agents.
Computer vision, Natural Language Possessing.

UNIT-II

UNIT-III

UNIT-IV
Machine Learning: Supervised and unsupervised learning, Decision trees, Statistical learning models, Learning with complete data - Naive Bayes models, Learning with hidden data - EM algorithm, Reinforcement learning,

UNIT-V

References:
RCAI-604: Introduction to Automata Theory & Languages

Unit-I

Basic concepts of Automata Theory: Alphabets, Strings and Languages, Deterministic Finite Automata (DFA) and Nondeterministic Finite Automata (NFA) – Definition, Representation using Transition Tables and State Diagrams, Language of DFA and NFA. NFA with ε-transitions, Language of NFA with ε-transitions, Equivalence of NFA and DFA.

Unit – II

Regular Expressions and Languages: Introduction, Definition of regular expression, Kleen’s Theorem, Equivalence of regular expression and Finite Automata, Pumping Lemma for regular Languages, Closure properties of Regular Languages, Decision properties of Regular Languages, Finite Automata with Output: Moore and Mealy Machine, Equivalence of Moore and Mealy Machines.

Unit – III

Non-Regular Grammars: Definition of Grammar, Classification of Grammars, Chomosky's Hierarchy. Context Free Grammars (CFG) and Context Free Languages (CFL) - Definition, Examples, Derivation trees, Ambiguous Grammars, Simplification of Grammars, Normal forms of CFGs: CNF and GNF, Closure properties of CFLs, Decision Properties of CFLs, Pumping lemma for CFLs. Push Down Automata (PDA): Definition and Description, Language of PDA and its applications.

Unit – IV


Unit – V

Undecidability: Introduction, Undecidable problems about Turing Machines, Rice's Theorem, Post's Correspondence problem (PCP) and Modified PCP. Tractable and Intractable Problems: P and NP, NPComplete Problems, Introduction to recursive function theory.

Text Books:

3. Elements and Theory of Computation, C Papadimitrou and C. L. Lewis, PHI.
5. Theory of Computation and Application: Automata Theory And Formal Languages, Dr. Anil Kumar Malviya and Dr. MalabikaDatta, BPB Publication

RCAI-605 : UNIVERSAL HUMAN VALUES & PROFESSIONAL ETHICS

“Universal Human Values & Professional Ethics” syllabus mentioned in the university portal.
RCAI-651 : Database Management Systems Lab

Objectives:

1. Installing oracle.
2. Creating Entity-Relationship Diagram using case tools.
3. Writing SQL statements Using ORACLE/MYSQL:
   a) Writing basic SQL SELECT statements.
   b) Restricting and sorting data.
   c) Displaying data from multiple tables.
   d) Aggregating data using group function.
   e) Manipulating data.
   f) Creating and managing tables.
4. Normalization in ORACLE.
5. Creating cursor in oracle.
6. Creating procedure and functions in oracle.
7. Creating packages and triggers in oracle.

Note: The Instructor may add/delete/modify/tune experiments, wherever he/she feels in a justified manner.

RCAI-652 : MINI PROJECT

Guidelines to prepare Mini-Project:

The student is expected to take up any industry oriented application and develop a mini-project on this topic preferably on C, C++, JAVA, VB etc. The implementation should involving all the phases of software development life-cycle i.e. problem formulation, design, and testing and implementation phases with proper project report during the semester.

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