2021

ACADEMIC YEAR

COURSE STRUCTURE FOR MASTER
OF COMPUTER APPLICATION

RCM
Regional College of Management

#TransformationBeginsHere

SYLLABUS
MCA
2021-2023

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BIJU PATNAIK UNIVERSITY OF TECHNOLOGY, ODISHA

ROURKELA

Curriculum and Syllabus

2 Yrs Master in Computer Application (MCA)

from the Admission Batch

2020-21

First Semester							
Theory							
Sl. No.	Category	Course Code	Course Title	L-T-P	Credit	University Marks	Internal Evaluation
1	BS	MCA01001	Discrete Mathematics	3-0-0	3	100	50
2	PC	MCA01002	Computer System Architecture	3-0-0	3	100	50
3	PC	MCA01003	C and Data Structure	3-0-0	3	100	50
4	PC	MCA01004	Operating System	3-0-0	3	100	50
5	PC	MCA01005	Database Engineering	3-0-0	3	100	50
Total Credit (Theory)					**15**		
Total Marks						**500**	**250**
Practical							
1	PC	MCA01006	Data Structure Using C Lab	0-0-3	2		100
2	PC	MCA01007	Operating System Lab	0-0-3	2		100
3	PC	MCA01008	Database Engineering Lab	0-0-3	2		100
Total Credit (Practical)					**6**		
Total Semester Credit					**21**		
Total Marks							**300**

1st Semester	MCA01001	Discrete Mathematics	L-T-P 3-0-0	3 CREDITS

Module-I **(10 Hours)**

Logic: Propositional equivalence, predicates and quantifiers, Methods of proofs, proof strategy, sequences and summation, mathematical induction, recursive definitions and structural induction, program correctness, prepositional calculus.
Counting: The basics of counting, the pigeonhole principle, permutations and combinations, recurrence relations, solving recurrence relations, generating functions, inclusion-exclusion principle, application of inclusion-exclusion.

Module-II **(10 Hours)**

Relations: Relations and their properties, n-array relations and their applications, representing relations, closure of relations, Warshall's algorithm, equivalence of relations, partial orderings.
Graph theory: Introduction to graphs, graph terminology, representing graphs and graph isomorphism, connectivity, Euler and Hamilton paths, planar graphs, graph coloring, introduction to trees, application of trees.

Module-III **(06 Hours)**

Group theory: Groups, subgroups, generators and evaluation of powers, cosets and Lagrange's theorem, permutation groups and Burnside's theorem, isomorphism, auto orphisms, homomorphism and normal subgroups, rings, integral domains and fields.

Module-IV **(08 Hours)**

Lattice theory: Lattices and algebras systems, principles of duality, basic properties of algebraic systems defined by lattices, distributive and complimented lattices, Boolean lattices and Boolean algebras, uniqueness of finite Boolean expressions.

Module-V **(06 Hours)**

Coding theory: Coding of binary information and error detection, decoding and error correction.

Books:

1. C. L. Liu, D.P. Mohapatra “Elements of Discrete Mathematics- A Computer-Oriented Approach”, 4th Edition, Tata McGraw Hill, 2013.
2. K.H. Rosen, “Discrete Mathematics and its application”, 5th edition, Tata McGraw Hill Publication
3. G. Shankar Rao, “Discrete Mathematical Structure”, New Age Publisher
4. D. P. Acharjaya, Sreekumar “Fundamental Approach to Discrete Mathematics”, New Age Publisher

1st Semester	MCA01002	Computer System Architecture	L-T-P 3-0-0	3 CREDITS

Module – I: **(08 Hours)**

Introduction: Review of basic computer architecture, Quantitative techniques in computer design, measuring and reporting performance.

Module – II: **(08 Hours)**

Pipelining: Basic concepts, Instruction and Arithmetic pipeline, Data hazards, Control hazards and Structural hazards, Techniques for handling hazards. Exception handling. Pipeline optimization techniques.

Module – III: **(08 Hours)**

Hierarchical memory technology: Inclusion, Coherence and locality properties, Cache memory organizations, Techniques for reducing cache misses; Virtual memory organization, Mapping and Management techniques, Memory replacement policies.

Module – IV: **(08 Hours)**

Instruction-level Parallelism: Basic concepts, Techniques for increasing ILP, Superscalar, Superpipelined and VLIW Processor architectures. Array and Vector processors

Module – V: **(08 Hours)**

Multiprocessor architecture: Taxonomy of Parallel Architectures, Centralized shared- memory architecture, Synchronization, Memory consistency, Interconnection networks. Distributed shared memory architecture. Cluster computers

Books:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, "Computer Organization", Fifth Edition, Tata McGraw Hill, 2002.
2. William Stallings, "Computer Organization and Architecture – Designingfor Performance", Sixth Edition, Pearson Education, 2003.
3. Patterson, "Computer Organisation and Design", Elsevier
4. John P Hayes, "Computer Organization", McGraw Hill
5. Morris Mano," Computer System Architecture", PHI

1st Semester	MCA01003	C and Data Structure	L-T-P 3-0-0	3 CREDITS

MODULE – I **(10 Hours)**

C Language Fundamentals, Arrays and Strings

Character set, Identifiers, Keywords, Data Types, Constant and Variables, Statements, Expressions, Operators, Precedence of operators, Input – output Assignments, Control structures, Decision making and Branching, Decision making & looping. Declarations.

MODULE – II **(10 Hours)**

Monolithic vs Modular programs, User defined vs standard functions, formal vs Actual arguments, Functions category, function prototypes, parameter passing, Recursion, Storage Classes: Auto, Extern, Global, Static.Character handling in C. String handling functions. Pointers, Structures, Union & File handling

MODULE – III **(10 Hours)**

Pointer variable and its importance, Pointer Arithmetic passing parameters, Declaration of structures, pointer to pointer, pointer to structure, pointer to function, unions dynamic memory allocations, unions, file handling in C.

MODULE – IV **(10 Hours)**

Development of Algorithms: Notations and Analysis, Storage structures for arrays-sparse matrices, Stacks and Queues: Applications of Stack: Prefix, Postfix and Infix expressions. Circular queue, Double ended queue.

Books:

1. E. Balagurusamy, Programming in ANSI 'C', 8th Edition, Tata McGraw Hill, 2019.
2. Reema Thareja, Data Structures Using C, 2nd Edition ,Oxford University Press, 2014.
3. M. Tanenbaum, "Data Structures using C & C++", Prentice-Hall of India Pvt. Ltd.
4. A.K.Rath and A. K. Jagadev, "Data Structures and Program Design using C", 2nd Edition, Scitech Publications, 2011.
5. Bruno R Preiss, "Data Structures and Algorithms with Object Oriented Design Pattern in C++", John Wiley & Sons, Inc., 1999.
6. Horowitz and Sahani, "Fundamentals of data Structures",Galgotia Publication Pvt. Ltd.

1st Semester	MCA01004	Operating System	L-T-P 3-0-0	3 CREDITS

MODULE-I **(08 Hours)**

Overview of Operating Systems: Introduction, how OS takes System Control, Why OS is essential, Functions of the Operating Systems, Evolution of Operating Systems, Generations of OS.

MODULE-II **(08 Hours)**

Operating System Structure & Processes: Introduction, System Components, Operating System Structure, Operating System Services, System Calls, System Programs, Process, Process States, Process Control.

MODULE-III **(08 Hours)**

Operating System Services for Process Management & Scheduling: Introduction, Process Creation, Termination & Other Issues, Threads, Multithreading, Types of Threads, Schedulers, Types of Schedulers, Types of Scheduling, Scheduling Algorithms, Types of Scheduling Algorithms.

MODULE-IV **(08 Hours)**

Process Synchronization, Interprocess Communication & Deadlock: Introduction, Data Access and Control Synchronization, Critical Sections, Race Condition, Classical Problems & Solutions of Process Synchronization, Semaphores, Message Passing, Deadlock, Conditions for Deadlock, Resource Allocation Graph, Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlocks.

MODULE-V **(08 Hours)**

Memory Management & Virtual Memory: Introduction, Memory Management Schemes, Sharing and Protection in Paging, Sharing and Protection in Segmentation, Virtual Memory, Demand Paging, Page Replacement Algorithms, Thrashing

Books:

1. Silberschatz and Galvin, “Operating System Concepts”, John Wiley Publishing
2. William Stallings, “Operating Systems Internals & Design Principles”, Pearson Education
3. Naresh Chauhan, “Principles of Operating Systems”, Oxford India Publications
4. Pabitra Pal Choudhury, “Operating System Principles and Design”, PHI Publication
5. Sibsankar Halder and Alex A. Aravind, “Operating System”, Pearson Education

1st Semester	MCA01005	Database Engineering	L-T-P 3-0-0	3 CREDITS

Module -I **(06 Hours)**

Introduction to DBMS: concept and overview of DBMS, data models, DB languages, DB users and Administrator, 3-schema architecture of DBMS, data independence, EF Codd Rule.

Module -I I **(06 Hours)**

ER Model: basic concepts, design issues, keys, ER diagram, Weak entity sets, Extended ER features. Relational model: structure of relational model, Relational algebra, Extended relational algebra Operations.

Module – III **(08 Hours)**

Relational database design: FDs, Anamolies in designing DB, Normalization using FDs, various Normal forms-1NF, 2NF, 3NF, BCNF, 4NF, 5NF.

Module-IV **(10 Hours)**

SQL and Integrity Constraints: Concepts of DDL, DML, DCL, various SQL operations: set operations, aggregate functions, constraints, view, nested sub queries, PL/SQL, cursor, trigger.

Module – V **(10 Hours)**

Internals of RDBMS: Query optimization, various optimization algorithms, Transaction processing, concurrency control and recovery management. Advanced Database: OODB, WEB based DB, Data warehousing and Data mining.

Books:

1) Korth, Silverschatz, Abraham," Database system concepts", Tata McGraw Hill Publication
2) R.Elmasri, S.B Navathe, "Fundamentals of Database System", Adision Wesley Publishing
3) Er.Rajiv chopra, "Database management systems, A Practical Approach", S.Chand Publishing
4) Ramkrishna, "Database management systems", Tata McGraw Hill Publication

1st Semester	MCA01006	Data Structure Using C Lab	L-T-P 0-0-3	2 CREDITS

LIST OF EXPERIMENTS:

1. Implementation of Stack Using Array.
2. Implementation of Queue Using Array.
3. Implementation of Infix to Postfix Conversion using Stack.
4. Evaluation of Postfix Expression using Stack.
5. Implementation of Singly Linked List.
6. Implementation of Doubly Linked List.
7. Implementation of Stack Using Linked List.
8. Implementation of Queue Using Linked List.
9. Implementation of Binary Tree Traversal : Preorder, Inorder and Postorder.
10. Implementation of Binary Search Tree.
11. Implementation of sorting algorithms : Bubble Sort, Selection Sort, Insertion Sort, Quick Sort, Merge Sort and Heap sort.
12. Implementation of Searching Algorithms : Linear Search and Binary Search
13. Implementation of Breadth First Search (BFS) in a Graph.
14. Implementation of Depth First Search (DFS) in a Graph.
15. Implementation of Hashing using hash functions.

1st Semester	MCA01007	Operating System Lab	L-T-P 0-0-3	2 CREDITS

LIST OF EXPERIMENTS:

1. Write a C program to simulate the following non-preemptive CPU scheduling algorithms to find turnaround time and waiting time.

a) FCFS b) SJF c) Round Robin (pre-emptive) d) Priority

2. Write a C program to simulate Multi-level Feedback Queue Scheduling algorithm considering the following scenario. All the processes in the system are divided into two categories – System processes and User processes. System processes are to be given higher priority than user processes. Use FCFS scheduling for the processes in each queue.

3. Write a C program to simulate the MVT and MFT memory management techniques.

4. Write a C program to simulate the following Contiguous Memory allocation techniques

a) Worst-fit b) Best-fit c) First-fit

5. Write a C program to simulate Paging technique of Memory management.

6. Write a C program to simulate Bankers algorithm for the purpose of deadlock avoidance.

7. Write a C program to simulate Disk scheduling algorithms a) FCFS b) SCAN c) C-SCAN

8. Write a C program to simulate Page replacement algorithms a) FIFO b) LRU c) LFU

9. Write a C program to simulate Page replacement algorithms a) Optimal

10. Write a C program to simulate Producer-Consumer problem using semaphores.

11. Write a C program to simulate the concept of Dining-Philosophers problem.

1st Semester	MCA01008	Database Engineering Lab	L-T-P 0-0-3	2 CREDITS

LIST OF EXPERIMENTS:

1. Execute a single line and group functions for a table.
2. Execute DCL and TCL Commands.
3. Create and manipulate various DB objects for a table.
4. Create views, partitions and locks for a particular DB
5. Write PL/SQL procedure for an application using exception handling
6. Write PL/SQL procedure for an application using cursors.
7. Write a DBMS program to prepare reports for an application using functions.
8. Write a PL/SQL block for transaction operations of a typical application using triggers.
9. Write a PL/SQL block for transaction operations of a typical application using package.
10. Design and develop an application using any front end and back end tool (make use of ER diagram and DFD).
11. Create table for various relation.
12. Implement the query in sql for a) insertion b) retrieval c) updating d) deletion.
13. Creating Views
14. Writing Assertion
15. Writing Triggers
16. Implementing operation on relation using PL/SQL
17. Creating Forms
18. Generating Reports

Regional College of Management

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