

MCA Programme Structure (2019 Batch)

Second Semester					
Theory					
Sl. No.	Category	Course Code	Course Title	L-T-P	Credit
1	IT	19MC201	Data Structure using C	3-0-0	3
2	IT	19MC202	Operating Systems	3-0-0	3
3	BM	19MC203	Management Information System/DSS	3-0-0	3
4	MATH	19MC204	Mathematics - II	3-0-0	3
5	BM	19MC205	Communicative English	2-0-0	2
Total Credit (Theory)					14
Practical					
1	LAB	19MC206	Data Structure Lab	0-0-4	2
2	LAB	19MC207	Operating Systems Lab	0-0-4	2
3	LAB	19MC208	Communicative English Lab	0-0-2	1
Total Credit (Practical)					5
Total Semester Credit					19

19MC201	Data Structures using C (3-0-0)	3 Credits
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Module- I: (10 Hrs.)

Abstract Data Types – Definition and Representation, ADT of rational number, ADT of Stack, Data Structure and ADT. Stack and its usages: reversing string, matching parentheses, in fix to postfix, decimal to binary number. Queue: linear & circular queue, Deque & Applications. Matrix – sparse and dense. Representation of sparse matrix, Transpose & addition of sparse matrices.

Module- II: (8 Hrs.)

Linked list and its representation: using array, using self-referential structure. Singly, circular and double linked lists. Operations on linked list – Insertion, Deletion, Traversals. Usages of Linked list – insertion sort, Addition/multiplication of polynomials. Addition/Multiplication of large numbers.

Module- III: (12 Hrs.)

Tree: Definition and Terminologies, child and parent nodes, Sub tree, root, leaf node, internal node, height of a tree. Binary, ternary, quad tree. Binary tree traversals. Reconstruction of binary tree from traversals. Binary search tree – inserting a new key, deleting a key, searching a key. AVL tree – inserting a new key into an AVL tree using rotations. B-tree: insertion and deletion using node splitting and merging.

Module- IV: (6 Hrs.)

Sorting and Searching: Bubble sort, selection sort quick sort and merge sort. Linear and binary search, Fibonacci search.

Module- V: (5 Hrs.)

Basic Graph Algorithm: Graph representation – adjacency matrix and list – pros and cons. Graph traversals – Depth First Search and Breadth First Search.

Suggested Books:

1. Data Structures: A Pseudocode Approach with C – Gilberg & Forouzan, 2nd Edition, Cengage, Indian Reprint 2016
2. Data Structures and Program Design in C – Kruse, Leung, 2nd Edition, Pearson, 2008
3. Data Structures Using C – Yedidyah Langsam & Moshe J. Augenstein Aaron M. Tanenbaum, 3rd Edition, Pearson, 2009
4. Algorithms and Data Structures: The basic toolbox, Kurt Mehlhorn and Peter Sanders, Springer, 2010
5. Programming and Data Structures (NPTEL) – (Vodeo lectures by Dr. Naveen Garg, IIT Delhi, new course available from July 2019)

19MC202	Operating Systems (3-0-0)	3 Credits
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Module- I: (8 Hrs.)

Overview: Operating System, , Simple Batch Processing Systems, Multiprogramming and Time sharing systems Operating System Structures, Operating System Services and system calls.

Process: Process Concept, Process Scheduling, Operation on Processes, Inter-process communication, Examples of IPC Systems, Multithreading Models, Threading Issues.

Module- II: (10 Hrs.)

Process Scheduling: scheduling criteria, scheduling algorithms

Process Synchronization: Critical section problem, two-process and multi-process solutions, Semaphores, Classical problems of synchronization, Monitors.

Deadlocks: System model, Deadlock Characterization, Handling Deadlocks, Deadlock Prevention, Deadlock avoidance, Deadlock Detection and recovery from Deadlock.

Module- III: (10 Hrs.)

Memory Management: Memory Management strategies, Logical versus Physical Address space, swapping, contiguous Allocation, Paging, Segmentation.

Virtual Memory: Background, Demand paging, performance of Demand paging, Page Replacement, Page Replacement Algorithms, Allocation of frames, Thrashing and its prevention, Paging with segmentation

Module- IV: (6 Hrs.)

File system: file structure, file operations, file access methods, Directory Structure, Directory Implementation, and Allocation Methods

Mass Storage: Overview of Mass Storage Structure, Disk Structure, Disk Scheduling, Disk Management, Swap-Space Management

Module- V: (6 Hrs.)

I/O System: I/O System Overview, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Request to Hardware Operation

Case studies on Linux: Basic Concepts; System Administration-Requirements for Linux System Administrator, Setting up a LINUX Multifunction Server, Domain Name System, Setting up Local Network Services

Suggested Books:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne: Operating System Concepts, 8th edition, Wiley-India, 2009
2. William Stallings, Operating Systems: Internals and Design principles, 6th Edition, PHI Learning Pvt. Ltd, 2010
3. H.M. Deitel, P. J. Deitel, D. R. Choffnes, Operating Systems, 3rdEdition, Pearson Education, Dec 2003

4. Andrew S. Tanenbaum: Mordern Operating Systems, 4th Edition, Pearson Education, 2014
5. Naresh Chouhan: Principles of Operating System, Oxford University Press.

Web Courses/Online courses:

1. <https://nptel.ac.in/courses/106106144/2> (Prof. Chester Rebeiro, IIT Madras)
2. <https://nptel.ac.in/syllabus/106108101/> (Prof. P.C.P. Bhatt, IISc Bangalore)

19MC203	Management Information System/DSS (3-0-0)	3 Credits
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Course Objective:

1. To understand and asses the importance of information and its role in business.
2. To develop data analyzing skills in students to evaluate information and the tools used for information processing.
3. To imbibe theoretical knowledge of MIS in the students and prepare the students technological competitive and make them ready to self-upgrade with the higher technical skills.

Module-1:

(8 Hrs.)

Fundamentals of Information Systems, Systems approach to problem solving, Developing information system solutions. Information system components, Information quality, Data resource management, Information Systems in marketing, manufacturing, HRM, Accounting and Finance.

Module-2:

(12 Hrs.)

Information analysis and design tools: Decision tools, Decision Table, Structured Analysis, Dataflow Analysis, Tools for dataflow strategy, Developing dataflow diagrams, Leveling, Data dictionary, Structured flow chart, HIPO, Warnier/ORR diagram.

Module-3:

(8 Hrs.)

Planning & implementation of Information Systems, Transaction Processing Systems, Executive information Systems, Decision Support Systems, Expert Systems, Knowledge Management. Different types of Security & recovery measures of Information System.

Module-4:

(8 Hrs.)

Decision Making: Introduction and Definitions, Simons Decision Making Model, How Decisions are Supported, DSS Configurations, DSS Characteristics and Capabilities. Components of DSS, DSS Classifications DSS Modeling-Static and Dynamic Models, Certainty, Uncertainty, and Risk, Sensitivity Analysis, What-IF, and Goal Seeking,

Module-5:

(8 Hrs.)

Making Decisions in Groups: Group Decision Support System(GDSS), Characteristics, Process, Benefits, and Dysfunctions, Supporting Group work with Computerized Systems, Tools for Indirect and Indirect Support of Decision Making, From GDSS to GSS.

Course Outcome:

1. Understand the information needs of an organization and business function.
2. Evaluate effectiveness of decision making process and identify its tools.
3. Understand DSS techniques for making effective decisions.
4. Design parameters for MIS application, for data analysis uses.

Suggested Books:

1. James A. O'Brien, George M. Marakas, "Management Information Systems", Tenth Edition, McGraw-Hill Education (India), New Delhi.
2. Kenneth C. Laudon, Jane P. Laudon, "Management Information Systems", Tenth Edition, Pearson Education Inc., New Delhi.
3. Turban, Efrain: Decision Support & Business Intelligent Systems(8e)- Pearson Education.
4. Marakas,George.M.: Decision Support Systems in the 21st century - Pearson Education.
5. Kenneth E. Kendall, Julie E. Kendall "System Analysis and design", PHI Learning Pvt. Ltd., New Delhi.
6. James A. Senn "Analysis & Design of Information Systems", McGraw-Hill Education, New Delhi
7. Keen,Peter G.W.: Decision Support System and Organizational Perspective Addison-Wesley Pub.

19MC204	Mathematics - II (3-0-0)	3 Credits
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Course Objective:

1. To provide suitable and effective methods called Numerical Methods, for obtaining approximate representative numerical results of the problems.
2. To understand the concept of accuracy and precision with examples.
3. To locate roots of the equations by using Bisection method.
4. To understand one point iterative method to find appropriate roots. To Know the open method like Newton-Raphson Method and Secant method
5. To understand various skills like interpolation, numerical integration and solution of differential equation.
6. To introduce students the use of quantitative methods & techniques for effective decision making
7. Model formulation.
8. Application that are used in solving business decision problems.
9. Decision to maximize profit and minimize loss.

10. Taking decision involving queuing lines.
11. To handle project planning effectively.

Module- I: Numerical Method (9 Hrs.)

Approximations and Errors in Computation. Root finding methods: Bisection, Newton Raphson and Secant methods. Interpolation: Newton Divide Difference, Lagrange Method and Cubic Spline approximation.

Module- II: Numerical Method (8 Hrs.)

Integration: Trapezoidal, Simpson's 1/3 rule & Gauss Quadrature methods for two and three point. Ordinary differential equations of First order by Euler's, Modify Euler's & Runge-Kutta Methods.

Module- III: Operation research-1 (8 Hrs.)

Introduction to Linear Programming Problem: Formulation of LPP. Solution of LPP by : Graphical, Simplex, Big-M, Dual Simplex Methods. Integer Linear Programming by Branch and Bound Method.

Module- IV: Operation research-2 (8 Hrs.)

Transportation Problem: Formulation and solution by MODI Method. Assignment Problem: Formulation and solution by Hungarian method. Introduction to Queuing Theory: Characteristics of queuing models, solution to single channel with poisson arrivals and exponential service with finite and infinite population models :- $(M/M/1):(\infty/FCFS)$, $(M/M/1):(N/FCFS)$

Module- V: Operation research-3 (7 Hrs.)

Project Management: Visual display of a project, Scheduling a project with ERT/CPM, dealing with uncertain activity, Time-cost trade-offs, Scheduling and controlling project costs, evaluation of PERT/CPM.

Text Books:

1. M. K. Jain, S.R.K. Iyenger and R.K. Jain, "Numerical Methods for Scientific and engineering Computations", New age International Publication (P) Ltd.
2. P.K. Gupta and D.S.Hira **Operations Research**, S CHAND.

Reference Books:

1. S.S. Sastry, "Introductory Numerical Methods", Prentice Hall India Ltd.
2. Operations Research, Hiller, Libwerman, 8th edition TMH 2005.

19MC205	Communicative English (3-0-0)	3 Credits
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Module- I: Basics of communication skills (8 Hrs.)

Significance of communication, The process and factors of communication (the communication loop), Difference between General and Technical Communication, Verbal communication and its principles, Non-verbal communication, Paralinguistics, The importance of audience & purpose

Module- II: Basics of English pronunciation & Soft Skills (10 Hrs.)

Introduction to English pronunciation with the IPA chart, Received Pronunciation, problems of Indian English, Professional presentations, Group Discussion, Interview etiquette, Leadership skills

Module- III: Brush up your Grammar & Vocabulary (6 Hrs.)

Parts of speech & Tense, Concord, Parallelism, Word formation- root words, synonyms, antonyms, homonyms & homophones, Common errors in English Grammar.

(N.B. - Instead of teaching, this unit should be taught by assigning activities to the students in the class)

Module- IV: Basics of reading and writing skills (6 Hrs.)

Reading Skill: Types of reading, Sub-skills of reading: Skimming, Scanning, Reading comprehension, Writing Skill: Steps to writing, Describing, Defining, Classifying and Providing examples or evidence.

Module- V: Professional writing (10 Hrs.)

Paragraph, Letter, Memos & Circulars, Reports, Proposals, e-mails & CV.

Reference Books:

1. Communication Skills by Sanjay Kumar and Pushp Lata, Oxford University Press
2. Technical Communication, Principle and Practice by Meenakshi Raman & Sangeeta Sharma, Oxford University Press
3. Effective Technical Communication, M Ashraf Rizvi, Tata Mc Graw - Hill.
4. Business Communication, Meenakshi Raman & Prakash Singh, Oxford
5. Communication for Management, Urmila Rai and S M Rai, HPH
6. Business and Managerial Communication, Sengupta, PHI
7. Business Communication for Managers, P. Mehra, Pearson
8. Soft Skills K Alex, S Chand

Suggested Readings:

1. Manual of English Grammar and Composition. J.C. Nesfield Forgotten Books
2. Practical English Usage. Michael Swan. OUP.
3. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
4. A Course in English phonetics by T.R.KANSAKAR, ORIENT LONGMEN Press.
5. A Communicative Grammar of English, Leech, Geoffrey & Jan Svartvik, Longman

19MC206	Data Structure Lab (0-0-4)	2 Credits
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Prerequisites Programs:

1. Create a structure that stores a point in 2D. Accept 3 such points and find out the area of the triangle enclosed by these three points.
2. One array of numbers to be sorted. The no of element of the array is an user input. Create the array dynamically, accept its members and sort the array.

Programs for Evaluation Lab:

1. **(Integer stack simulation)** Write a structure for an integer stack, implement function push, pop, and pick, IsEmpty and IsFull function. Write a main function and call the functions based on an option entered.
2. **(Palindrome checking using stack)** Implement a stack of characters and create mystack.h. Write a program to check whether an entered string is a palindrome or not. One need to include mystack.h for calling the functions of character stack.
3. **(Simulating circular queue)** Defining structure of a circular queue (with a counter), write functions for inserting, deleting and counting no of elements present in the queue. Write functions IsFull and IsEmpty also. Write main function to call them.
4. **(Infix to Postfix)** Write a program to convert an infix expression into its corresponding postfix expression. The expression contains alphabets, operators and parentheses. During the conversion all possible checks for the correctness should be checked. [(a+b)/(c-d) would output ab+cd-/, ((a+b)^c-d would give error as "unmatched parenthesis]
5. **(Insertion sort)** A singly linked list gives a better way to implement insertion sort. A flat file contains some unknown number of integers. Implement insertion sort using a singly linked list that reads the next integer from the file and insert it into a linked list in its proper position. Write a function that prints the list after all elements is properly inserted into the linked list.
6. **(Polynomial addition)** Represent a polynomial of a single variable using a singly linked list. Write functions createPolynomial that stores one polynomial in a singly linked list. Write a function to add two such linked lists.
7. **(BST simulation)** Declare a binary search tree where information at each node would be a single integer. Write functions for inserting a key, deleting a key from the tree. Write recursive traversal routines. After each insertion/deletion find all traversal results.
8. **(Bubble sort)** One array of numbers to be sorted. The no of element of the array is a user input. Create the array dynamically, accept its members and sort the array using bubblesort algorithm. Also count the total number of swaps.
9. **(Quick sort)** Write a function to implement recursive quick sort algorithm and using this function sort an array of integers. Write another function to search for a key in this sorted array using binary search.

10. **(Merge Sort)** Implement recursive mergesort using an array of fixed size and hence sort an array of double numbers using this function.
11. **(Heap sort)** Implement heapify, build heap and heapsort routines. Apply heapsort to sort an array of numbers. Write a function to search for a given key in this sorted array using sequential search.
12. **(BFS traversal)** Clearly declaring data structure of a graph, Write functions to read a directed graph from a flat file and to implement BFS routine in a directed graph. Show the result of BFS traversal in distance and previous arrays.

19MC207	Operating System Lab (0-0-4)	2 Credits
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Course Objective:

1. To write UNIX shell scripting.
2. To understand and implement IPC mechanism using named and unnamed pipes.
3. To implement the scheduling algorithms.
4. To develop solutions for synchronization problems using semaphores.
5. To implement Deadlock avoidance algorithms.
6. To implement page replacement algorithms

Programs for Evaluation Lab:

1. Practicing of basic UNIX Commands as well as Linux administrative commands
2. UNIX Shell Programming covering array, string and functions
3. Shell scripting using GREP commands.
4. Shell scripting using AWK commands.
5. Inter Process Communication (IPC) using Pipes.
6. Programs on signals and system calls
7. Implement the algorithms of CPU scheduling algorithms like FCFS, SJF, SRTF, Priority and RR using C/C++.
8. Write C/C++ programs to implement the classical synchronization problems like Dining Philosopher and reader-writer problems using semaphore.
9. Implementation of deadlock avoidance algorithm using C/C++.
10. Implementation of page replacement algorithms like FIFO, LRU and Optimal.

Suggested Books:

1. Jain S, Pillai V, Kratika, Rai A, Basics of OS, UNIX and SHELL Programming, BPB Publication, 2017
2. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System concepts, 8th edition, Wiley-India, 2009
3. Andrew S. Tanenbaum: Modern Operating Systems, 4th Edition, Pearson Education, 2014.

(This unit involves interactive practice sessions in Language Lab)

1. Listening Comprehension
2. Pronunciation, Intonation
3. Stress and Rhythm practice
4. Common Everyday Situations: Conversations and Dialogues
5. Formal Presentations
6. Reading Comprehension
7. Report writing
8. Writing letters, e-mails,
9. Writing essay, CV, etc...
10. Grammar activities