

Department of Information Technology
Government Degree College (Autonomous), Baramulla

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| COURSE TITLE | Operating Systems |
| COURSE CODE | BIT22C501 |
| SEMESTER | 5 th |
| COURSE TYPE | MAJOR/MINOR |
| CREDITS | 06(4+2 credits) |

Course Objectives:

- Understand the role and importance of operating systems in modern computing environments.
- Explain key concepts and principles of process management, memory management, file systems, and I/O systems.
- Analyze and solve problems related to concurrency and synchronization.
- Apply theoretical knowledge to practical scenarios through hands-on exercises.

UNIT-I

(15 Hours)

Introduction to operating systems, types of operating systems– batch systems , multiprogramming systems, time sharing systems; Functions of OS(Process Management ,Memory Management , File Management, I/O Management).
System view of the process and resources, process model, process states, process hierarchy; Thread: Introduction, types of threads, threading issues, thread libraries, multithreading.

UNIT-II

(15 Hours)

Inter-process communication: Process synchronization, critical section problem, Peterson’s solution, semaphores, classical problems, monitors.

Process scheduling: Types of schedulers, scheduling criteria: CPU utilization, Throughput, Turnaround Time, waiting time, response time; pre-emptive and non- pre-emptive process scheduling algorithms;

Deadlocks: Definition, conditions for Deadlock, Deadlock Modelling, Ostrich Algorithm, Deadlock detection and recovery, Deadlock avoidance, Banker’s Algorithm, Deadlock Prevention.

UNIT-III

(15 Hours)

Memory Management

Physical and virtual address space; Swapping, contiguous memory allocation, Fixed and variable partition- Internal and external fragmentation and memory compaction, paging, structure of the page table, segmentation, Virtual memory- locality of reference, Page fault, Hit-Miss ratio, demand paging, page-replacement algorithms: Optimal, First In

Department of Information Technology
Government Degree College (Autonomous), Baramulla

First Out (FIFO), Second Chance (SC), Clock Page Replacement Algorithm, Not Recently used (NRU), Least recently Used (NRU), Least Recently Used (LRU).

UNIT-IV

(15 Hours)

File Management: Concept of a file , file operations, access methods, directory structure, file system mounting, file sharing, protection.

Disk Management: Mass Storage Structure: overview of mass storage structure, disk structure, disk scheduling algorithms (FCFS, SSTF, SCAN, C-SCAN, F-SCAN).

I/O Hardware: I/O Devices, Device controllers, Direct memory access. Principals of I/O software: Goals of interrupt handlers, device drivers, Device independent I/O software.

Text Book:

A Silberschatz, P.B. Galvin, G. Gagne, Operating Systems Concepts, 8thEdition, John Wiley Publications 2008.

Recommended Books:

1. A.S. Tanenbaum, Modern Operating Systems, 3rd Edition, Pearson Education 2007.
2. G. Nutt, Operating Systems: A Modern Perspective, 2nd Edition Pearson Education 1997.
3. W. Stallings, Operating Systems, Internals & Design Principles , 5th Edition, Prentice Hall of India. 2008.
4. M. Milenkovic, Operating Systems- Concepts and design, Tata McGraw Hill 1992.

Department of Information Technology
Government Degree College (Autonomous), Baramulla

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| COURSE TITLE | Design and Analysis of Algorithms |
| COURSE CODE | BIT22C502 |
| SEMESTER | 5 th |
| COURSE TYPE | MAJOR |
| CREDITS | 06 (Theory 4 + Lab 2) |

Course Objectives:

- Understand the fundamental concepts and techniques used in algorithm design.
- Analyze the time and space complexity of algorithms.
- Apply different algorithm design paradigms to solve computational problems.
- Apply learned concepts to real-world problems and evaluate algorithmic solutions.

UNIT-I (15 Hours)

Introduction

Introduction to Algorithms, Correctness of Algorithm. Performance Analysis: Space complexity, time complexity, asymptotic notation (big Oh notation, omega notation, theta notation).

Recurrences, Substitution method, Iteration method, Recursion trees. The Master Method.

Algorithm Design Techniques: Iterative techniques, Divide and Conquer, Dynamic Programming, Greedy Algorithms.

UNIT-II (15 Hours)

DIVIDE AND CONQUER: General method, applications, analysis of binary search, quick sort, merge sort, AND OR Graph.

GREEDY METHOD: General method, Applications-job sequencing with deadlines, Fractional knapsack problem, minimum spanning trees (Kruskal's algorithm, Prim's algorithm), Single source shortest path problem.

UNIT-III (15 Hours)

GRAPHS (Algorithm and Analysis): Breadth first search and traversal, Depth first search and traversal, Spanning trees, connected components and bi-connected components, Articulation points.

UNIT-IV (15 Hours)

DYNAMIC PROGRAMMING: Introduction, The Principle of Optimality, General method, applications - optimal binary search trees, 0/1 knapsack problem, All pairs shortest path problem, Travelling sales person problem.

Backtracking: General method, 8-Queen problem, Sum of subsets, Knapsack problem.

Department of Information Technology

Government Degree College (Autonomous), Baramulla

Text Book:

1. Ellis Horowitz, Satraj Sahni, Rajasekharam (2007), Fundamentals of Computer Algorithms, 2nd edition, University Press, New Delhi.

Recommended Books:

1. T.H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein Introduction to Algorithms, PHI, 3rd Edition 2009
2. R. C. T. Lee, S. S. Tseng, R.C. Chang and T. Tsai (2006), Introduction to Design and Analysis of Algorithms A strategic approach, McGraw Hill, India.
3. Allen Weiss (2009), Data structures and Algorithm Analysis in C++, 2nd edition, Pearson education, New Delhi.
4. Aho, Ullman, Hopcroft (2009), Design and Analysis of algorithms, 2nd edition, Pearson education, New Delhi
5. Sara basse & A.V. Gelder Computer Algorithm – Introduction to Design and Analysis, Publisher – Pearson 3rd Edition 1999.

DESIGN AND ANALYSIS OF ALGORITHMS LAB (2 Credits)

Course Outcomes: At the end of the Course the student shall be able to

- Develop programs for sorting a given set of elements and analyse its time complexity.
- Solve and analyse the problems using greedy methods.
- Solve and analyse the problems using dynamic programming.
- Apply backtracking method to solve various problems.
- Apply branch and bound method to solve 0/1 knapsack problem.

LIST OF EXPERIMENTS:

1. Implement Selection sort and find how many steps are required to sort 10 elements.
2. Implement and Analysis factorial of a number program using iterative and recursive methods.
3. Implement Insertion Sort and analyse the time complexity.
4. Given two strings, find the minimum number of edits required to convert one string to another.
5. Write a program to check whether a given graph is connected or not using the DFS method.
6. Implement fractional knapsack problem using Greedy Strategy.

Department of Information Technology
Government Degree College (Autonomous), Baramulla

7. Implement minimum spanning tree using Prim's algorithm and analyse its time complexity.
8. Apply dynamic programming methodology to implement 0/1 Knapsack problem.
9. Apply dynamic programming methodology to find all pairs shortest path of a directed graph using Floyd's algorithm.
10. Find a subset of a given set $S = \{s_1, s_2, \dots, s_n\}$ of n positive integers whose sum is equal to a given positive integer d . For example, if $S = \{1, 2, 5, 6, 8\}$ and $d = 9$ there are two solutions $\{1, 2, 6\}$ and $\{1, 8\}$. A suitable message is to be displayed if the given problem instance doesn't have a solution.
11. Implement N-Queens problem using backtracking.
12. Find the solution of the 0/1 Knapsack Problem using LC Branch and Bound.
13. Find the solution to the Travelling Salesman Problem. Repeat the experiment for a graph having total number of nodes $(n) = 4, 8, 12, 16, 20$ and note the time required to find the solution. Plot the graph taking n on the x-axis and time on y-axis and analyze the graph to determine whether it is exponential or not.

Department of Information Technology
Government Degree College (Autonomous), Baramulla

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| COURSE TITLE | Internship |
| COURSE CODE | BIT22C503 |
| SEMESTER | 5 th |
| CREDITS | 2 credits |

List of Internships for 5th semester

- **Internship in Web Development:** Focusing on front-end or back-end development of websites or web applications.
- **Internship in Mobile App Development:** Developing applications for mobile platforms like iOS and Android.
- **Internship in UX/UI Design:** Designing user interfaces and improving user experience for websites or applications.
- **Internship in Database Management:** Assisting in managing and optimizing databases, writing queries, and ensuring data integrity.
- **Internship in Digital Marketing Technology:** Learning about tools and technologies used in digital marketing campaigns.