**Course:** BTech                                                              **Semester:** 5

**Prerequisite:** Strong programming skills and a solid understanding of algorithms and their analysis are prerequisites for learning and applying Design and Analysis of Algorithms | 203105101 - Fundamentals of Programming

**Rationale:** Design and Analysis of Algorithms (DAA) is crucial for efficient problem-solving and algorithm development. It provides tools to measure algorithm performance and make informed decisions on choosing the best algorithms for specific tasks. DAA helps optimize time and space complexities, leading to improved computational efficiency.

## Teaching and Examination Scheme

| Teaching Scheme | | | | | Examination Scheme | | | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Lecture Hrs/Week | Tutorial Hrs/Week | Lab Hrs/Week | Hrs/Week | Credit | Internal Marks | | | External Marks | | |
| | | | | | T | CE | P | T | P | |
| 0 | 0 | 2 | 0 | 1 | - | - | 20 | - | 30 | 50 |

**SEE** - Semester End Examination, **CIA** - Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

## Course Outcome

**After Learning the Course the students shall be able to:**

1. Develop the ability to design and implement efficient algorithms for fundamental problems.
2. Cultivate critical thinking skills to analyze problem requirements and constraints, allowing for the selection and modification of appropriate algorithms to solve specific computational problems.
3. Master the use of essential data structures such as arrays, matrices, graphs, and trees to efficiently store, manage, and manipulate data within algorithm implementations.
4. Learn techniques for optimizing algorithms to improve their efficiency and scalability, focusing on aspects such as time complexity, and space complexity,

| List of Practical | |
|---|---|
| 1. | write a program to determine whether the given number is Prime or not. |
| 2. | Given a sorted array and a target value,return the index if the target is found. If not,return the index where it would be if it were inserted in order. |
| 3. | There are N children standing in a line with some rating value. You want to distribute a minimum number of candies to these children such that: Each child must have at least one candy. The children with higher ratings will have more candies than their neighbours. You need to write a program to calculate the minimum candies you must give. |
| 4. | There is a new barn with N stalls and C cows. The stalls are located on a straight line at positions x1,xN (0 <= xi <= 1,000,000,000). We want to assign the cows to the stalls, such that the minimum distance between any two of them is as large as possible. What is the largest minimum distance? |
| 5. | Given an undirected graph with V vertices and E edges, check whether it contains any cycle or not |
| 6. | There are n servers numbered from 0 to n – 1 connected by undirected server-to-server connections forming a network where connections[i] = [ai, bi] represents a connection between servers ai and bi. Any server can reach other servers directly or indirectly through the network.A critical connection is a connection that, if removed, will make some servers unable to reach some other servers. Return all critical connections in the network in any order. |
| 7. | Given a grid of size NxM (N is the number of rows and M is the number of columns in the grid) consisting of '0's (Water) and '1's(Land). Find the number of islands. |
| 8. | Given a grid of dimension N x M where each cell in the grid can have values 0, 1, or 2 which has e following meaning: 0: Empty cell

1: Cells have fres
2. Cells have oranrotten oranges

We have to determine what is the minimum time required to rot all oranges. A rotten orange at index [i,j] can rot other fresh oranges at indexes [i-1,j], [i+1,j], [i,j-1], [i,j+1] (up, down, left and right) in unit time' |
| 9. | Given two strings str1 and str2 and below operations that can be performed on str1. Find minimum number of edits (operations) required to convert 'str1' into 'str2'.Insert Remove Replace, All of the above operations are of equal cost. |
| 10. | Minimum Path Sum" says that given a n x m grid consisting of non-negative integers and we need to find a path from top-left to bottom right, which minimizes the sum of all numbers along the path. |
| 11. | Given string num representing a non-negative integer num, and an integer k, return the smallest possible integer after removing k digits from num. |
| 12. | There is a robot on an m x n grid. The robot is initially located at the top-left corner (i.e., grid[0][0]).The robot tries to move to the bottom-right corner (i.e., grid[m - 1][n - 1]). The robot can only move either down or right at any point in time.Given the two integers m and n, return the number of possible unique paths that the robot can take to reach the bottom-right corner. |

| Miscellaneous | |
|---|---|

**Exam Requirement**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc