UE18CS323: Graph Theory and its Applications (4-0-0-4-4)

This course focuses on mathematical structure to model the relations between the objects. It also discusses about the basics of graph theory together with a wide range of applications to different branches of Science and Technology, and to real-world problems.

Course Objectives:
- Familiarize with concepts and abstraction of GraphTheory.
- Up skill students with computer representation of graphs and algorithms.
- Introduce students with advanced concepts in graph theory andapplications.
- Teach graph theoretical modeling of problems and solution.

Course Outcomes:
At the end of this course, the student will be able to:
- Understand the graph theory concepts, abstractions and results to model real-world problems.
- Implement high performance computer representation graph algorithms.
- Understand various application of graph theory in varieddiscipline.
- Become familiar with advanced concepts in graph theory and itsapplications.

Pre-Requisite:UE18CS151 – Problem Solving with C, UE18CS202 – Data Structures.

Course Content:
Unit 1: Introduction, paths and circuits

Introduction – Review of Representation and Traversals, Walks, Paths-Circuits –Connectedness –Euler graphs – Hamiltonian paths and circuits – Directed graphs – Types of directed graphs – Digraphs and binary relations – Directed paths and connectedness.

10 Hours

Unit 2: Tress, Cuts and planar Graphs
Trees – Properties of trees – Distance and centres in tree – Rooted and binary trees-Spanning trees – Spanning trees in a weighted graph – cut sets – Properties of cut set – All cut sets – Fundamental circuits and cut sets – Connectivity and separability – Network flows – -Isomorphism– Combinational and geometric graphs – Planer graphs – Different representation of a planer graph.

12 Hours

Unit 3: Coloring, Covering and Partitioning
Chromatic number – Chromatic partitioning – Chromatic polynomial – Matching – Covering – Four Colour problem – Counting.

12 Hours

Unit 4: Graph Applications - 1

Shortest Path Problem, Connector Problem, Reliable Communication Network Problem, Chinese Postman Problem, Travelling Salesman Problem, Optimal Assignment Problem, Time Table Problem.

12 Hours

Unit 5: Graph Applications - 2

Program Analysis-Program Optimization-General Optimization- Max Flow Min Cut-Critical Path Analysis-Applications in Social Network Analysis-Other Engineering Applications.

12 Hours

Tools / Languages : C- Language.

Text Book:

1. "Graph Theory: With Application to Engineering and Computer Science",Narsingh Deo, Prentice Hallof India, 2017.

Reference Book(s) :

1: "Graph Theory", F. HARARY, Addison-Wesley,1969.
2: Latest Web based resources