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Graph Theory
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Course description

This course is a beginner course on Graph Theory with focus on understanding the structure of graphs and techniques used in solving problems involving graphs. Specifically, this is a theoretical study of graphs that covers many combinatorial results and classical theorems in graph theory.

Course contents

Basics Graphs, the degree of a vertex, Paths and cycles, Connectivity, Trees and Forests, Bipartite Graphs, Contraction and minors.

Matching Matching in Bipartite graphs- Konigs Theorem, Halls Theorem, Matching in General graphs - Tuttes theorem, Path Covers - Gallai Milgram Theorem.

Connectivity 2-connected and 3-connected graphs, Mengers Theorem.

Planar Graphs Eulers formula, Kuratowskis Theorem.

Colouring Chromatic number, Chromatic index, Five colour theorem, Brooks Theorem, Edge Colouring, Vizings Theorem, List Colouring.

Substructures Minors, Topological minors, Hadwigers conjecture.

Advanced Topics Hamiltonian Paths, Perfect Graphs.

Assessments

- Quiz 1 and mid-semester examination: 40 marks

- Quiz 2 and final examination: 40 marks

- Course seminar/project: 20 marks

Pre-requisites

Discrete Mathematics, Data Structures.

Text books/Reference books

- Graph Theory by Reinhard Diestel, Springer-Verlag, Graduate Texts in Mathematics, August 2016.

- Introduction to Graph Theory by Douglas B. West, Pearson Education, Second Edition, 2001.