GRAPH THEORY & APPLICATIONS

MATH/CSCI 4150/8156

Course Description:

Introduction to graph theory. Representations of graphs and graph isomorphism. Trees as a Special case of graphs. Connectivity, covering, matching, and coloring in graphs. Directed graphs and Planar graphs. Applications of graph theory in several fields such as networks, social sciences, VLSI, chemistry, and parallel processing. **3 credits**

Prerequisites:

MATH/CSCI 2030 or permission of instructor

Overview of Content and Purpose of the Course:

The main objective of this course is to study the main concepts of graph theory and to recognize graphs as an important modeling technique in several applications. At the end of this course, a student should be able to apply the abstract concepts of graph theory in several practical problems.

Anticipated Audience/Demand:

Junior (and above) mathematics and computer science majors and minors.

Major Topics:

The course covers the basic definitions and concepts related to classical graph theoretic problems. The course also covers a number of applications in which graph modeling are known to be useful.

1) Introduction and basic definitions

2) Graph representations and graph isomorphism

3) Trees and their special properties and applications

4) Connectivity, Euler tours and Hamiltonian cycles

5) Coverings and matchings

6) Cliques and independent sets

7) Vertex colorings and edge colorings

8) Directed graphs and applications

9) Planar graphs and networks

10) General applications
   a. linear programming
   b. parallel processing
   c. chemistry
   d. formal language theory.

Methods:

The coverage will be primarily through lectures, with homework assignments and individual projects.

Textbook:

Agnarsson, Geir, and Raymond Greenlaw**.** *Graph Theory: Modeling, Applications, and Algorithms*. London: Pearson, 2006.

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