University of Sri Jayewardenepura
Department of Mathematics
Semester I - 2017

MAT 455 2.0/ASP 423 2.0 Graph Theory

Lecturer-in-Charge	Lecture Room	Email	Time
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Objectives

The aims of this course are twofold. First, to provide an introduction to fundamental of graph theory and graph algorithms. Second, to emphasis many examples and applications of graphs.

Intended Syllabus

1. Graphs

   1.1. Basic definitions in graph theory

   1.2. Traveling through a graph

      1.2.1. Connectedness

      1.2.2. Euler tours

      1.2.3. Hamiltonian cycles

   1.3. Graph representation

      1.3.1. Adjacency matrices

      1.3.2. Adjacency lists

   1.4. Planarity of Graphs

      1.4.1. Euler's formula

      1.4.2. Kuratowski's theorem

   1.5. Coloring of graphs

      1.5.1. Vertex coloring, edge coloring, and Chromatic number

      1.5.2. Color theorems

2. Trees

   2.1. Basic definitions for trees

      2.1.1. Rooted trees

      2.1.2. Ordered trees, binary trees, and m-ary trees

   2.2. Spanning trees

      2.2.1. Depth-first search

      2.2.2. Breadth-first search

   2.3. Minimum spanning trees

      2.3.1. Prim's algorithm

      2.3.2. Kruskal's algorithm

3. Paths and Flows

   3.1. Shortest paths and longest paths

      3.1.1. Dijkstra's algorithm

      3.1.2. The traveling salesman problem

   3.2. Flows

      3.2.1. The Ford-Fulkerson algorithm

      3.2.2. The maxflow-mincut theorem

References

1. *Graph Theory and Its Applications* by Jonathan L. Gross and Jay Yellon (available in the main library).

2. *Handbook of Graph Theory* by Jonathan L. Gross, Jay Yellon and Ping Zhang.

Learning Outcomes

On successful completion of this module, the student should be able to:

- demonstrate an understanding of the general concepts in graph theory

- apply the abstract concepts of graph theory in modeling and solving problems in different fields of study

- demonstrate the abilities in critical thinking and problem solving.

Assessment Criterion

Continuous Assessment	40%
End of Semester Examination	60%

Method of Continuous Assessment

1. Assignments will be assigned frequently and will always be collected.

2. Unannounced quizzes will be given at the end of randomly selected lectures.

3. There will be a group project worth 15% of your final grade. Your group will need to choose a graph theory paper published in a journal within the last 5 years, prepare a written report on it, and present it in class.