University of Sri Jayewardenepura
Department of Mathematics
PG Diploma / M.Sc in Industrial Mathematics - 2018/2019

IM 524 2.0 Graph Theoretic Applications

Lecturer-in-Charge	Duration	Lecture Room	Email	Time
Dr. G. H. Jayantha Lanel	30 Hours	M1	ghjlanel@sjp.ac.lk	Sun: 8.00-12.00noon.

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. Graph Theory

    1.1. Basic Definitions in Graph Theory

    1.2. Graph Coloring

    1.3. Minimum Spanning Trees

    1.4. Shortest Paths

    1.5. Network Flow

    1.6. Matching and Vertex Covering

2. Some Applications of Graph Theory

    2.1. Graph Coloring Techniques in Scheduling

        2.1.1. Time Table, Aircraft and Job Schedulings

        2.1.2. Bi-processor Tasks

        2.1.3. List Coloring and Minimum Sum Coloring

        2.1.4. Map Coloring and GSM Mobile Phone Networks

    2.2. Graph Algorithms in Computer Network Security

        2.2.1. Graph Theory Relevant to Ad-hoc Networks

        2.2.2. A Graph Model for Fault Tolerant Computing Systems

        2.2.3. Graphical Representation of Algorithm

    2.3. Graph Theory in Symbol Recognition

    2.4. Clustering of Web Documents Using Graph Model

    2.5. Graph Based and Structural Methods for Fingerprint Classification

    2.6. Further Applications.

References

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

2. Any introductory Graph Theory book.

Projects

There are two projects in this course.

1. There will be a project worth 15% of your final grade and this is a group (at least 2 students) project. Your group will need to choose a paper (application of graph theory) approved by me and published in a research journal within the last 5 years, prepare a written report on it, and present it in class. The written report should be about 5 pages, and it should include the main idea of the paper in your own words, an outline of the proofs of the major results in the paper, as well as discussion of the findings. The oral presentations will take about 25 minutes each during the 4th week of the classes.

2. There will be an another project worth 25% of your final grade and this is an individual work. You will need to choose a paper (involving conjectures/research problems/open problems) approved by me and published in a mathematics research journal, prepare a written report on it, and present it in class. The written report should be more than 5 pages, and it should include the main idea of the paper in your own words, an outline of the proofs of the major results in the paper, as well as discussion of the background and setting for this work (this involves looking at some of the relevant references). The oral presentations will take about 30 minutes each during the last couple of weeks of classes. Your goal is to explain what the paper achieves, why it is important and where it might lead. Discuss your choice of the paper with me by the end of 4th week of classes.

The reports and presentations must be prepared using LaTeX.

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

Projects	40%
End of Semester Examination	60%