Syllabus 2017 Computer and Mathematical Sciences

Information Technology Fundamental

Japanese

Basic information

held this year:	yes
instructor(s)	Prof. Dr. Md. Saidur Rahman
room	GSIS-6Fsmall lecture room
schedule	The first half year
begins on:	An intensive lecture

Objectives and outline

Course Title: Graph Theory and Its Applications in Computer Science

Course Outline :
Graphs and their applications; Basic graph terminologies; Basic operations on graphs; Graph representations; Degree sequence and graphic sequence; Paths, cycles and connectivity; Trees and counting of trees; Distances in graphs and trees; Euler tours; Hamiltonian cycles; Ear decomposition; Matching and covering; Planar graphs; Graph coloring; Special classes of graphs.

Learning Outcomes/Objectives:
After undergoing this course, students should be able to:
i. explain and demonstrate the concepts and terminologies of graph theory,
ii. develop graph theoretic models of real world problems and explore graph algorithmic solutions of the problems,
iii. prove graph theoretic propositions and write mathematical proofs,
iv. design efficient algorithms based on graph theoretic proofs, and
v. apply graph theoretic concepts and techniques in their research areas.

Class plan

Teaching Method:
Interactive teaching method will be followed. Multimedia slides (in Powerpoint and Beamer) will be used for illustrations while concepts and proofs will be explained on board.

Lecture Plan:
(June 29)
*Lecture 1
Applications of graphs for problem solving in computer science,
various areas of Engineering and technology, life sciences, business,
social sciences, etc.; Basic graph terminologies: adjacency, incidence and degree.

*Lecture 2
Basic graph terminologies: subgraphs; Elementary classes of graphs,
Operations on graphs; Graph Isomorphism, Graph Representations.

*Discussion Hour
Discussions, Tutorial and Problem Solving on the Topics Covered in
Lecture 1 & Lecture 2.

(June 30)
*Lecture 3
Walks, trails, paths and cycles; Eulerian graphs; Hamiltonian graphs;

*Lecture 4
Connectivity; Connected separable graphs and block-cutvertex tree;
2-connected graphs, Ear decomposition.

*Discussion Hour
Discussions, Tutorial and Problem Solving on the Topics Covered in
Lecture 3 & Lecture 4.

(July 3)
*Lecture 5
Properties of trees, rooted trees, spanning trees; Counting of trees;
Distances in trees and graphs.

*Lecture 6
Matching: perfect matching, maximum matching, Hall's matching condition

*Discussion Hour
Exam I (30 minutes); Discussions, Tutorial and Problem Solving on the topics
covered in Lecture 3 & Lecture 4.

(July 4)
*Lecture 7
Covers, independent sets, dominating sets; Planar graphs: Kuratowski's
characterization, Euler's formula.

*Lecture 8
Planar graphs: thickness of graphs, dual graphs, straight-line drawings of planar graphs.

*Discussion Hour
Discussions, Tutorial and Problem Solving on the Topics Covered in
Lecture 7 & Lecture 8.

(July 5)
*Lecture 9
Graph coloring: vertex coloring, edge coloring, map coloring; Digraphs.

*Lecture 10
Special classes of graphs;

*Discussion Hour
Exam II (45 minutes). Discussions and Closing.

Evaluation

I will give a problem sheet everyday. These problems will be discussed in discussion hour of the day. I will ask the students to submit written solution of some of the problems in the sheet as a report in the next day. Two exams will be held: one on July 3 and the other on July 5.
Score distribution will be as follows: Attendance 10%, Report: 30%, Exam I: 30%, Exam II: 30%.

Textbook(s)

1. Md. Saidur Rahman, Basic Graph Theory, Springer, 2017.
2. Robin J. Wilson, Introduction to Graph Theory, 4th Edition, Pearson Education Asia, 1995.
3. Douglas B. West, Introduction to Graph Theory, 2nd Edition, Pearson Education Asia, 2001.
4. J. Clark and D. A. Holton, A First Look at Graph Theory, World Scientific, 1991.
5. Takao Nishizeki and Md. Saidur Rahman, Planar Graph Drawing, World Scientific, 2004.

Web site

Office hours

Other information

Top