SYST 420 001
Network Analysis
CRN 71002
George Mason University
Fall 2017

Instructor: Ursula Morris
Class Time: Tu, Th 12:00 p.m. - 1:15 p.m.
Email: **UMorris1@gmu.edu**
Class Room: Innovation Hall 131
Office Hours: after class or by appointment
Adjunct Office

Course Description

This course introduces network flow problems. These problems arise in many fields like computer networking, engineering, scheduling and routing, transportation, and telecommunication. The course provides insights into applications, modeling, and algorithms for network flow problems.

The course begins with an introduction into network nomenclature, elementary graph theory, data structures, complexity theory, search algorithms and flow decomposition. Using these concepts, different shortest path and maximum flow algorithms are analyzed and applied to various problems.

A lecture on minimum cost spanning trees prepares the class for the remaining fundamental topics: assignment and matching algorithm, minimum cost network flow algorithm and network simplex. As time permits, other topics might be added to the course.

Course Objectives

This course challenges the students' analytical skills.

The students will learn network terminology and graph theory. This knowledge will enable the students to present and model real world problems using these concepts.

The knowledge of data structures, search algorithms, complexity consideration, and flow decomposition enables the students to analyze and compare algorithms.

The students will understand and use different algorithms to solve shortest path, maximum flow, minimum cost spanning tree, and minimum cost network flow, and assignment and matching problem as network problems. The students will understand and apply optimality criteria for the different algorithms.

The students will use the software package MPL to solve network problems.

Text recommended, not required!

Network Flows: Theory, Algorithms and Applications, by Ravindra K. Ahuja, Thomas L. Magnanti and James B. Orlin, published by Prentice Hall 1993.

Lecture notes will be posted on blackboard.

Software

During the course, a software package called MPL will be used. A free student version can be obtained by going to http://www.maximalsoftware.com downloading the student version, and requesting an activation code asap.

Course Topics (tentative)

Chapter	**Lecture Topic**s
1	Introduction
2	Network Terminology
3	Network Transformations
4	Network Representations
5	'Pure Network Models'
6	Introduction to Complexity
7	Search Algorithms
8	Flow Decomposition
9	Shortest Path Label Setting Algorithms
10	Shortest Path Label Correcting Algorithms
11	Max Flow Algorithms
12	Max Flow – Min Cut
13	Minimum Cost Spanning Trees
14	Assignments and Matchings
15	Minimum Cost Network Flows
16	Network Simplex
17	(Additional Topics)

Homework
A legible paper copy of the homework is due in the beginning of each **Thursday class**. The teacher decides if every homework problem or just a selection of the problems will be graded. It is recommended to do all the assigned homework problems.

Mini Quizzes
Some classes will begin with a mini quiz (10 points each). The worst of those mini quiz grades will be deleted.

Grading

Homework	15%
Midterm	35%
Final Exam	35%
Mini Quizzes	10%
Participation	5%

Make-up tests will be 10% harder.

A: 100% – 90%; **B**: 89% – 80%; **C**: 79% – 70%; **D**: 69%– 60%; **F**: 59% – 0%.

Exam Schedule:

Midterm	Th, Oct. 12, 2016
Final Exam	Th, Dec. 14, 2017 from 10:30 -1:15

Important Dates

- Columbus Day Oct. 9
- Thanksgiving Nov. 22-26
- Last day of class Dec. 9
- Reading Days Dec. 11-12

GMU Blackboard Learn:

Course Information will be made available on
https://mymasonportal.gmu.edu/webapps/login/

University Honor Code

Every student is expected to follow the GMU Honor Code.

http://oai.gmu.edu/the-mason-honor-code