Online Course Syllabus

Based on the official UTD Online/Blended Syllabus Template

Course Information

Course Number/Section	CS/TE 6385.0W1
Course Title	Algorithmic Aspects of Telecommunication Networks
Term	Fall 2023

Professor Contact Information

Professor	Dr. Andras Farago
Office Phone	972-883-6885
Email Address	farago@utdallas.edu
Office Location	ECSS 4.204
Office Hours	Every workday 9:00-4:00pm via e-mail (after-hours e-mails will be answered the next business day)

Teaching Assistant: to be announced (contact information will be posted in eLearning)

Course Modality and Expectations

Instructional Mode	Online, asynchronous.
Course Platform	eLearning
Expectations	Regular studying of the material, timely submission of assignments/projects and exams. Details about assignments, projects and exams will be announced in eLearning.
Asynchronous Learning Guidelines	This is an online asynchoronous course. The exams will also be online, in the eLearning system.

Health Guidelines and Resources

The information contained in the following web page summarizes the University's community health resources: https://www.utdallas.edu/community-health/

Class Participation and Student Code of Conduct

In this online asynchronous course, the course material will be posted in various forms in the eLearning system, including PowerPoint slides, pdf lecture notes, possibly with video narration for some of the slides. Participation means regularly studying the weekly course materials, but no particular day/time is set aside for this within the week. Participation also includes the timely submission of the projects. Late submissions will receive reduced credit. Students who fail to participate regularly are inviting scholastic difficulty. For the general rules of student conduct see Student Code of Conduct.

Class Materials

The Instructor provides class materials that will be made available in eLearning to all students registered for this class. These materials may be downloaded during the course; however, the materials are for registered students' use only. Classroom materials may not be reproduced or shared with those not in class or uploaded to other online environments except to implement an approved Office of Student AccessAbility accommodation. Failure to comply with these University requirements is a violation of the Student Code of Conduct.

Course Pre-requisites (from graduate catalog)

CS 5343 Algorithm Analysis & Data Structures
CS 5348 Operating Systems Concepts
TE 3341 Probability Theory and Statistics or equivalents.

Course Description

Purpose and content of the course: The purpose of the course is to make students familiar with fundamental methods in the design and analysis of telecommunication networks. The main emphasis is on the methodology that remains valid on the long term and does not depend strongly on frequently changing applications.

Outline of topics to be addressed: introduction to the network planning problem; mathematical programming for planning; network algorithms for planning; elements of network reliability; optimization for network design; network data analysis; selected topics form link level and network level traffic modeling and analysis for traffic engineering.

More detailed topic list

Note: The list is tentative, some topics may be skipped, new ones may be added.

- Fundamental concepts of network planning; Typical problems and issues in network design; Analysis vs. synthesis; Reasons for hardness in network planning; Decomposition approach to mitigate hardness; Pathways to optimum design: exact, approximate, heuristic.

- Optimization in network design; Linear Programming: formulation, solution principles, duality, network planning related applications; Integer Linear Programming: formulation, methods for linearizing non-linear integer programs, solution principles, exact and heuristic algorithms for integer programs, network design related applications.

- Graph algorithms for network design; maximum flow; minimum cost flow; multicommodity flow; flow based network design; network vulnerability analysis via graph connectivity; structure of optimally connected graphs under uniform costs, various theorems and algorithms related to graph connectivity; Karger's randomized contraction algorithm for minimum cut, Nagamochi-Ibaraki minimum cut algorithm. Outlook to recent new results.

- Algorithms and models for reliability analysis; Reliability concepts; Basic reliability configurations; More complex reliability configurations; Algorithms to compute exact and

approximate network reliability; Lifetime measures; Computing network lifetime measures in various settings.

- Traffic analysis for network planning; Integrating flow and queuing models in network planning to capture traffic considerations; Link capacity dimensioning for given flow and network topology; Flow routing for given topology and link capacities; Combined capacity and flow assignment when only the network topology and the traffic demand is given; Heuristic methods for optimizing capacities, flow routing, and network topology together, when only the traffic matrix is known; Blocking probability models at the link level, and at the network level; Reduced load approximation and the Erlang fixed point equations (optional).

Student Learning Objectives/Outcomes

Learning objectives		Outcomes (see explanation under the table)
Fundamental concepts of network planning		b,c
Optimization in network design		a,b,c,d,e
Graph algorithms for network design		a,b,c,e
Algorithms and models for reliability analysis		a,b,c,e
Traffic analysis for network planning		a,b,c

Outcomes

a. an ability to understand advanced concepts in theory of computer science;
b. an ability to understand advanced concepts in applications of computer science;
c. an ability to apply knowledge of advanced computer science to formulate and analyze problems in computing and solve them;
d. an ability to learn emerging concepts in theory and applications of computer science; and,
e. an ability to design and conduct experiments as well as to analyze and interpret data.

Required Textbooks and Materials

Materials written by the instructor and posted in eLearning. There is no required textbook.

Technical Requirements

In addition to a confident level of computer and Internet literacy, certain minimum technical requirements must be met to enable a successful learning experience. Please review the important technical requirements on the Getting Started with eLearning webpage.

Course Access and Navigation

This course can be accessed using your UT Dallas NetID account on the eLearning website.

Please see the course access and navigation section of the Getting Started with eLearning webpage for more information.

To become familiar with the eLearning tool, please see the Student eLearning Tutorials webpage.

UT Dallas provides eLearning technical support 24 hours a day, 7 days a week. The eLearning Support Center includes a toll-free telephone number for immediate assistance (1-866-588-3192), email request service, and an online chat service.

Communication

The main tool for student-instructor communication in this course is e-mail. Per university e-mail policy, please use your UTD e-mail address for course related communication (not gmail or other private addresses). Student emails will be answered within one working day under normal circumstances.

Distance Learning Student Resources

Online students have access to resources including the McDermott Library, Academic Advising, The Office of Student AccessAbility, and many others. Please see the eLearning Current Students webpage for more information.

Server Unavailability or Other Technical Difficulties

The University is committed to providing a reliable learning management system to all users. However, in the event of any unexpected server outage or any unusual technical difficulty which prevents students from completing a time sensitive assessment activity, the instructor will provide an appropriate accommodation based on the situation. Students should immediately report any problems to the instructor and also contact the online eLearning Help Desk. The instructor and the eLearning Help Desk will work with the student to resolve any issues at the earliest possible time.

Academic Calendar Fall 2023

WEEK/ DATES	TOPIC/LECTURE	READING	ASSESSMENT / ACTIVITY	DUE DATE
1 8/21- 8/25	Welcome Introduction, part I	Posted online material		
2 8/28- 9/01	Introduction, part II.	Posted online material		

WEEK/ DATES	TOPIC/LECTURE	READING	ASSESSMENT / ACTIVITY	DUE DATE
3 9/04- 9/08	Linear Programming and related Techniques, part I. 9/05 Labor Day Holiday	Posted online material		
4 9/11- 9/15	Linear Programming and related Techniques, part II.	Posted online material	Project 1	10/23
5 9/18- 9/22	Linear Programming and related Techniques, part III.	Posted online material		
6 9/25- 9/29	Linear Programming and related Techniques, part IV.	Posted online material		
7 10/02- 10/06	Network Reliability, part I.	Posted online material		
8 10/09- 10/13	Network Reliability, part II.	Posted online material		
9 10/16- 10/20	Network Reliability, part III.	Posted online material	Project 2	11/17
10 10/23- 10/27	Integer Programming, part I.	Posted online material	Project 1 due on 10/23	
11 10/30- 11/03	Integer Programming, part II.	Posted online material		
12 11/06- 11/10	Integer Programming, part III.	Posted online material		
13 11/13- 11/17	Integer Programming, part IV.	Posted online material	Project 2 due on 11/17	
14 11/20- 11/24	Fall Break Thanksgiving Holiday			
15 11/27-12/01	Exercises	Posted online material		

WEEK/ DATES	TOPIC/LECTURE	READING	ASSESSMENT / ACTIVITY	DUE DATE
16 12/04-12/08	Exam preparation **Final exam on Saturday, 12/09**	Posted online material		**Saturday, 12/09**

Exam Procedures

The exam will be conducted online in the eLearning system. To stay consistent with asynchronous access, and to avoid conflict with other courses, the exam will be made available for a 24-hour period, and each student can choose any time slot to do the exam within this period. The length of the allowed time slot will be specified by the instructor.

Grading Policy

	Item Weight
Projects 1,2	30% each
Final exam	40%

Course Policies

Late submissions will receive reduced credit. The reduction amount depends on how late the submission is.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

Academic Support Resources

The information contained in the following link lists the University's academic support resources for all students: Academic Support Resources

UT Dallas Syllabus Policies and Procedures

Please go to UT Dallas Syllabus Policies webpage for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.

♡ ***A final wish: Have a useful and enjoyable course!*** ♡