

**The University of Utah**  
**Department of Civil and Environmental Engineering**

**CVEEN 6920 Optimization in Transportation**  
**Syllabus for Fall 2018**

**Time:** M, W, F 10:35 a.m. – 11:45 a.m.

**Location:** Gardner Commons (GC 1570)

**Description:** Transportation engineers and researchers always have to face management, design, and control problems, such as delivery vehicles' routing, supply chain management and logistics, traffic signal plan design, and transportation network optimization. To solve those problems, it is essential to employ corresponding optimization models in the decision-making process. Particularly, most optimization tools can be found in the discipline of Operations Research (OR). This course aims to provide students with the fundamental knowledge and skills of quantitative techniques in OR. Topics covered in this course will include network concept introduction (shortest paths, minimum spanning tree, minimum cost network flows, maximum flows), linear programming, integer programming, network optimization, and application of OR in Transportation. Optimization software (e.g., Excel, Lingo, Cplex, etc.) will be introduced in the course.

**Objectives:** By the end of this course, students will be able to:

- Understand the basic concept of optimization and its application in transportation engineering;
- Formulate optimization models to solve various transportation network problems;
- Develop solution algorithms/heuristics to solve complex (e.g., NP-Hard) optimization problems; and
- Use the optimization tools to work on large scale optimization issues.

**Instructor:** Xianfeng (Terry) Yang, Ph.D., Assistant Professor at Department of Civil & Environmental Engineering

Office: 2133 Meldrum Civil Engineering (MCE)

Office hours: M, F 1:00 PM – 2:00 PM

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**Textbook:** "Operations Research: An Introduction, 10th Edition" by Hamdy A. Taha. (not required).

**Grading Policy:** Assignments: 25%  
 Quiz: 5%  
 Term Project: 25%  
 Midterm Exam: 20%  
 Final Exam: 25%

<b>Grading</b>	93-100	A
	90-92	A-
	87-89	B+
	83-86	B
	80-82	B-
	77-79	C+
	70-76	C
	60-69	D
<60	E	

**Course Schedule (Tentative) – Fall 2017**

Week	Day	Date	Topics	Note
1	M	Aug. 19	Introduction	
	W	Aug. 21	Network Problems	
	F	Aug. 23	Network Problems	
2	M	Aug. 26	Network Problems	
	W	Aug. 28	Network Problems	
	F	Aug. 30	Network Problems	Homework 1 Due
3	M	Sep. 2	Labor Day	
	W	Sep. 4	Network Problems	
	F	Sep. 6	Network Problems	Homework 2 Due
4	M	Sep. 9	Linear Programming Formulations	
	W	Sep. 11	Linear Programming Formulations	
	F	Sep. 13	Graphical Solution	Homework 3 Due
5	M	Sep. 16	Simplex Algorithm	
	W	Sep. 18	Simplex Algorithm	
	F	Sep. 20	Simplex Algorithm	Homework 4 Due
6	M	Sep. 23	Simplex Algorithm/Term Project Outline	
	W	Sep. 25	Simplex Algorithm	
	F	Sep. 27	Simplex Algorithm	Homework 5 Due
7	M	Sep. 30	Review of Midterm	
	W	Oct. 2	Simplex Algorithm	
	F	Oct. 4	Midterm	
8	M	Oct. 7	Fall Break	
	W	Oct. 9	Fall Break	

	F	Oct. 11	Fall Break	
9	M	Oct. 14	Duality Theory	
	W	Oct. 16	Duality Theory	
	F	Oct. 18	Duality Theory	Project Progress Report
10	M	Oct. 21	Integer Programming	
	W	Oct. 23	Integer Programming	
	F	Oct. 25	Integer Programming	Homework 6 Due
11	M	Oct. 28	Solution Heuristics	
	W	Oct. 30	Solution Heuristics	
	F	Nov. 1	Solution Heuristics	Homework 7 Due
12	M	Nov. 4	Software Introduction	
	W	Nov. 6	Software Introduction	
	F	Nov. 8	Software Introduction	Homework 8 Due
13	M	Nov. 11	Mixed Integer Linear Programming	
	W	Nov. 13	Mixed Integer Linear Programming	
	F	Nov. 15	Mixed Integer Linear Programming	
14	M	Nov. 18	Seminar	Term Project Report Due
	W	Nov. 20	Seminar	
	F	Nov. 22	Thanksgiving Day	
15	M	Nov. 25	Term Project Presentation	
	W	Nov. 27	Term Project Presentation	
	F	Nov. 29	Term Project Presentation	
16	M	Dec. 2	Seminar	
	W	Dec. 4	Review of Final Exam	
17			Final Exam	

**Note:** The syllabus is not a binding legal contract. The instructor may modify it when the student is given reasonable notice of the modification.

# Course Expectations and Policy

## Expectations for Course Work

The work in this course consists of homework, quizzes, and term project. All of them are designed to help you achieving the course learning objectives and should be completed on time. In addition to the assignments, two exams, one midterm and one final, will be employed to evaluate your learning through the course.

### **Homework:**

Homework assignments are individual efforts as described in *CVEEN Homework Assignments: Process of Solution and Formatting Requirements* (effective 9/1/2004):

*The completed homework assignments that you turn in for credit must be substantially your own work. It is permissible to discuss the basic concepts and how to solve the problem in a general sense with others prior to working on the assignment. Once you have started a problem, you may ask questions of other students, but the questions should be limited to specific aspects of a problem that you do not understand. It is not acceptable to work on the assignments with another person or in a group where the assignments are worked entirely together. You may get as much help from the Teaching Assistant and Professor for the class as they can legitimately give you during their regularly scheduled office hours or via e-mail (if the Teaching Assistant or Professor is willing to communicate via e-mail). It is not permissible to use either solution manuals or solutions from past classes for homework assignments that are turned in for credit. All assignments must have the following signed pledge at the front of the assignment:*

*On my honor as a student of the University of Utah, I have neither given nor received unauthorized aid on this assignment.*

*If the pledge is missing or is not signed, the assignment will not be graded.*

**Homework and applied problems are due by 5:00pm on the due date.** Homework deliverables must follow the Departmental formatting and style requirements given in *CVEEN Homework Assignments: Process of Solution and Formatting Requirements* (saved on the Canvas site as **Homework Requirements.pdf**).

The course schedule shows approximate dates for homework assignments and applied problems. Exact assignment and due dates will be identified during the semester by the instructor and announced during the regularly scheduled classroom meetings.

### **Exams**

The midterm exam will be held during multiple, regularly scheduled classroom meetings. The final exam will be held during the university-designated time. Conflict exam requests must be made at least two weeks prior to the exam date and will be decided on a case-by-case basis. The course content included on the exams as well as the exam format will be announced by the instructor during regularly scheduled class periods prior to the exam date. Every class is

different in terms of the pace of material coverage. The midterm exam dates on the course schedule are tentative and may be adjusted with ample notification.

### **Term Project**

A real-world problem will be provided to the students. Each student need to prepare several slides to present their methodology in solve the problem. The evaluation of term project will be based on the quality of presentation and final project report. The final report should not exceed ten pages (Font: Time New Roman; Font size: 12; Line Space: 1.3)

### **Accessibility**

The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Union Building, 581-5020 (V/TDD). CDS will work with you and the instructor to make arrangements for accommodations. ([www.hr.utah.edu/oeo/ada/guide/faculty/](http://www.hr.utah.edu/oeo/ada/guide/faculty/))

### **Professional Responsibilities:**

Students should read the “Student Code” (Policy 6-400: Code of Student Rights and Responsibilities) carefully and know they are responsible for the content. The Policy is located at the following link:

<http://www.regulations.utah.edu/academics/6-400.html>

All students are expected to maintain professional behavior in the classroom setting.<sup>1</sup> Students have specific rights in the classroom, detailed in Section II of the Student Code. The Student Code also specifies academic misconduct, including, but not limited to, cheating, misrepresenting one's work, inappropriately collaborating, plagiarism, and fabrication or falsification of information. The process for resolving any violations of the Student Code, including academic sanctions, is also described.

<sup>1</sup> Discussion threads, e-mails, and chat rooms are all considered to be equivalent to classrooms, and student behavior within those environments shall conform to the Code.

## **Course Policy**

**Late Homework Turn-ins.** You are required to turn in your homework on time. Late homework can be accepted within four days after the due date but will be discounted at 20% per day it is late. For example, if an assignment is due on May 10, and you turn it in on May 12, it would amount to a deduction of 40% for this two-day late assignment. If you turn in on May 15 or after, it will not be accepted and no credit will be given to this assignment of more than four days late.

**Safety Statement:**

University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit [safeu.utah.edu](https://safeu.utah.edu).

**Sexual Misconduct:**

Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).