CIVIL 477 Transportation network modeling & analysis

Spring 2025
Wednesday 13h15 – 16h @ CM 0 12

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Office hours: Wednesday 16h – 17h @ GC D2 401 (or by appointment)

Overview

This course introduces the classics and new advances in transportation network modeling and optimization. The course cover key concepts, behavioral principles, model formulations and solution approached used in traffic assignment and travel demand management. The course consists of four modules as follows:

- Basics of traffic network and equilibrium analysis
- Classic traffic assignment models and extensions
- Traffic demand management
- New advances in traffic network modeling

The course includes a combination of lectures and laboratories. The former focuses on introduding the theoretical foundations and models, while the latter provides hands-on experience of programming for formulating and solving the models .

Course materials

Lecture slides and exercise questions will be posted before each course, and the exercie answers will be provided afterwards. All these materials are based on the following books:

- Sheffi. *Urban Transportation Networks*. 1984
- Boyles, Lownes, and Unnikrishnan. *Transportation Network Analysis, Volume I: Static and Dynamic Traffic Assignment*. 2025
- Patriksson. *The Traffic Assignment Problem: Models and Methods.* 2015.

Some recent papers will also be provided over the semester to support the discussions of emerging research topics.

Grading

- Assignment: 20%
- Mid-term exam: 30%
- Project: 50%

Assignment

There is one individual assignment that will be published after the first module. An exercise session will be dedicated to assignment Q&A before each deadline. Discussion and collaboration are permitted but must be declared Late submissions are not accepted.

Midterm

The open-book midterm takes place in class. It will cover the materials of the first two modules and be based on the assignment. The midterm amounts 30% of the course grade.

Project

There is one project on selective topics. The project can be either single or a group of two persons. The grade will be determined based on a final presentation (20%), and the project report (30%).

Schedule

Week	Date	Topic	Assignment/Project
1	19.02	Introduction	
2	26.02	Network and route choice	
3	05.03	Game theory and traffic equilibrium	Assign. 1 published
4	12.03	Optimization primer	
5	19.03	Static traffic assignment: Base model I	
6	27.03	Static traffic assignment: Base model II	
7	02.04	Static traffic assignment: Extensions	Assign. 1 due
8	09.04	Stochastic traffic assignment	
9	16.04	Mid-term	Project published
10	23.04	*Easter break*	
11	30.04	Traffic demand management	
12	07.05	Emerging topic I: Shared mobility	
13	14.05	Emerging topic II: Autonomous vehicles	
14	21.05	*(TBD)*	
15	28.05	Project: final presentation	