

CIVIL-477

**Transportation network modeling & analysis**

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Cursus	Sem.	Type
Civil Engineering	MA2, MA4	Opt.
Civil engineering minor	E	Opt.

Language of teaching	English
Credits	3
Session	Summer
Semester	Spring
Exam	Oral
Workload	90h
Weeks	14
<b>Hours</b>	<b>3 weekly</b>
Courses	2 weekly
Exercises	1 weekly
<b>Number of positions</b>	

**Summary**

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.

**Content**

Module 1 : Basics of traffic network and equilibrium analysis

- Traffic network and vehicle routing
- Optimization over networks

Module 2 : Static traffic assignment and extensions

- Static traffic assignment
- Stochastic traffic assignment

Module 3 : Traffic demand management

- Incentive design
- Network design

Module 4 : New advances in traffic network modeling

- Shared mobility
- Autonomous vehicles

**Keywords**

vehicle routing, traffic equilibrium, network design, optimization

**Learning Prerequisites****Required courses**

MATH265 Introduction to optimization and operation research, CIVIL355 Introduction to transportation system

**Recommended courses**

CIVIL 349 Traffic Engineering, CIVIL-226 Introduction to machine learning for engineers

**Important concepts to start the course**

programming in python, constrained optimization

**Learning Outcomes**

By the end of the course, the student must be able to:

- Explain key concepts and properties of traffic networks and equilibria.
- Solve classic traffic assignment models.
- Develop network models to analyze novel transportation problems.

### Transversal skills

- Demonstrate the capacity for critical thinking
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Make an oral presentation.
- Write a scientific or technical report.

### Teaching methods

Lectures with assisted exercises ; regular checkout and feedback on project.

### Expected student activities

Attend lectures ; complete assignment ; attend exam ; participate in project.

### Assessment methods

Assignment (20%):

- one assignment before mid-term

Mid-term exam (30%):

- during the course and open-book

Project (50%):

- individual or groups of two
- final presentation (20%)
- final report (30%)

### Supervision

Office hours	Yes
Assistant.e.s	Yes
Forum	Yes

### Resources

#### Virtual desktop infrastructure (VDI)

No

### Bibliography

Equilibrium analysis with mathematical programming methods/Sheffi ; Transportation network analysis /Boyles and Lowmes.

### Ressources en bibliothèque

- [Urban transportation networks](#) : Equilibrium analysis with mathematical programming methods / Sheffi
- [Transportation network analysis](#) / Boyles

### Moodle Link

- <https://go.epfl.ch/CIVIL-477>