

CIVIL-457

**Fundamentals of traffic operations and control**

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Cursus	Sem.	Type
Civil Engineering	MA1, MA3	Opt.
Civil engineering minor	H	Opt.

Language of teaching	English
Credits	4
Session	Winter
Semester	Fall
Exam	During the semester
Workload	120h
Weeks	14
<b>Hours</b>	<b>4 weekly</b>
Courses	2 weekly
Exercises	1 weekly
Project	1 weekly
<b>Number of positions</b>	

**Summary**

The objectives of this course are to present the major elements of traffic operations and to develop basic skills in applying the fundamentals of traffic analysis and control. Students should be able to start applying these skills to model different aspects of congestion in urban systems.

**Content**

Introduction to fundamentals of urban traffic engineering, including data collection, analysis, and operations. Traffic engineering studies, traffic control devices, capacity and level of service analysis of freeways and urban streets for multimodal systems. Performance models and modeling techniques: queuing theory, network analysis and simulation. Different levels of traffic modeling, micro-, meso- and macro/network level). Design of control strategies for simple systems. Application of traffic operations to the design of isolated intersections and coordinated traffic signal control systems. Emission models, Public Transportation Operations, On demand transportation.

**Keywords**

traffic engineering, traffic flow theory, traffic management, ramp metering, public transportation

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

Transportation Systems Engineering (CIVIL-355) or Consent of the Instructor

**Important concepts to start the course**

A good level of knowledge in mathematics and programming as taught in the first 2 years of the Civil Engineering program.

**Learning Outcomes**

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

- Assess / Evaluate the performance of transport systems
- Optimize the level of mobility in a city
- Analyze the different types of congestion
- Apply control strategies in congested networks
- Illustrate with simple examples the complexity of transport systems

- Establish methodologies to model congestion

### Transversal skills

- Evaluate one's own performance in the team, receive and respond appropriately to feedback.
- Resolve conflicts in ways that are productive for the task and the people concerned.
- Respect relevant legal guidelines and ethical codes for the profession.
- Plan and carry out activities in a way which makes optimal use of available time and other resources.
- Continue to work through difficulties or initial failure to find optimal solutions.
- Access and evaluate appropriate sources of information.
- Collect data.

### Teaching methods

Lectures with slides and/or board description, exercises, group projects, seminars by invited professor

### Expected student activities

Attend lectures and exercise sessions, actively solve the lab in group, and critically analyze the results

### Assessment methods

Mid-term exam, final exam, homeworks, laboratories (in groups)

### Supervision

Office hours	Yes
Assistants	Yes
Forum	Yes

### Resources

#### Virtual desktop infrastructure (VDI)

No

#### Bibliography

Material is provided in moodle that consists of scientific papers and class notes

#### Moodle Link

- <https://go.epfl.ch/CIVIL-457>

### Prerequisite for

Courses and projects in transportation