Traffic Engineering (CIVIL-349)

COURSE INFORMATION

Units: 4

Course Format

2.5 hours of lecture per week + 1.5 hours of exercise or laboratory per week (on average)

Schedule

- *Scheduled time:* Thursday 14:15 – 18:00, CM 1 105
    - *Exercise sessions:* Thursday 16:30 (approximately) – 18:00, CM 1 105
    - *Lab sessions*: on selected Thursdays 16:15-18:00, CM 1 103
    - *Midterm exam* (Written): **November 7, 14:15 – 15:45**, CM 1 105
    - *Final exam* (Written): **December 19, 14:15 – 17:00**, CM 1 105

Instructor in Charge

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Teaching Assistants

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Office hours for additional questions: Wednesdays 12:00 – 13:00 or by appointment

Course Objectives and Description

- Introduce the major elements of transportation systems and create awareness for the broader context
- Develop basic skills in applying the fundamentals of the transportation field
- Understand the key concepts and <u>physics</u> of the transport phenomena
- Connect with <u>real</u> transportation <u>problems</u>
- Be prepared for further study in this field

To this end, the course entails five *themes*.

1. Transportation Systems and Mobility
Mobility – Activities – Land Use, Classification-Hierarchy, Multimodality

2. Traffic monitoring
Observation, Measurement, Sensing Techniques, Queueing Theory; the collection and interpretation of transportation data.

3. Basic Assessment Tools
Predominantly graphical tools useful for understanding details of transport operations; common properties of traffic streams (flow, density and speed)

4. Modeling and Operations
Relations between properties of traffic streams and spatio-temporal models of congestion, Traffic flow modeling, Control and capacity of transport systems, car-following models, shockwave theory

5. Design of Multimodal Systems
Urban Policy, Case Studies, Intro to bus operations

Grading

The final grade for CIVIL-349 will take into account performance in the written midterm and final exams as well as team projects (laboratories). The final written exam will last 165 minutes and will involve questions focusing on the different topics covered during the course and the laboratories. The midterm exam will have a similar style and last 90 minutes.

Exercise sessions involve problem-solving with the teaching assistants. They do not require significant effort outside classroom and do not directly contribute to the final grade. No submission is required, and solutions will be posted after each week's exercise session. It is highly recommended that you practice these problems to prepared for the exams.

Homework	0%
Midterm	30%
Final Exam	40%
Laboratories	30%
Total	100%

The midterm and final exams are closed book. One personal A4 sheet handwritten on both sides is allowed per student; the notes must be entirely your own, i.e., photocopies of any printed material or other students' notes may result in grade penalties.

The final grade is estimated based on the relative performance of all students at each exam.

Lectures

LUTS has recently developed an online MOOC course on traffic modeling and ITS. Some of the material in the TSE course are included in the MOOC. During week 2, there will be a MOOC-only lecture, where students will watch videos on their own about class material and then questions will be answered by Prof. Geroliminis and the teaching assistants during exercise sessions.

Textbook

This course does not have a unique course book. The lecture notes are the reference for the course and will be posted regularly on Moodle after each lecture. Additionally, complementary reading material (book chapters, slides, handouts) will be made available, if appropriate, in electronic format on Moodle. Access to this material will be limited to people enrolled in the class.

Academic Integrity/Plagiarism

Presenting another's ideas, words or pictures as your own, or giving/accepting unauthorized help on assignments or exams - contradict the high educational value of EPFL Honor Code. Students who attempt to obtain unearned academic credentials that do not reflect their skills weaken the value of the EPFL degrees earned by the honest students. Plagiarism and Cheating of any kind on an examination, or assignment will result at least in a zero grade for that assignment (and depending on the severity of the case, it may be subject to appropriate referral to the EPFL Disciplinary committee. In all of your assignments, including your exam notes and lab code and reports, you may use words or ideas written by other individuals in publications, web sites, or other sources, but only if you have fully identified the original source and extent of your use of the words or ideas of others that you reproduce, in the form of a footnote.

CIVIL-349 Traffic Engineering
Thursday 14:15 – 16:30, CM1105

EPFL

COURSE SCHEDULE (tentative)

SESSION	DATE	TOPIC
1	12/9	Introduction to Transportation Systems Queueing Theory
2	19/9	Traffic flow variables (MOOC Lecture) Fundamental Diagram (MOOC Lecture)
3	26/9	Input-Output Diagrams Traffic flow modeling -LWR Theory
4	3/10	Laboratory 1
5	10/10	Introduction to on - demand transportation and sharing systems (Prof. Kenan Zhang, EPFL)
6	17/10	Car-Following models Traffic Monitoring and Data Collection
7	31/10	Merge Dynamics (Spatial extend of queues, Bottlenecks), Ramp metering
8	7/11	Midterm exam (14:15-15:45) + Data Collection for Lab 2
9	14/11	Introduction to Public Transit
10	21/11	Mobility Plan (analysis - diagnosis - objectives), Examples of big events, Intro to soft modes (Franco Tufo, CEO Citec)
11	28/11	Laboratory 2
12	5/12	Fundamentals of Signal Design Part I (Pre-timed Signal Control, Coordination)
13	12/12	Fundamentals of Signal Design Part II Lecture by Prof. Haddad Review (using advanced problems)
14	19/12	Final Exam 14:15-17:00

EXERCISE SCHEDULE

SESSION	DATE	TOPIC	DURATION
1	12/9	Exercise n° 1	(1hr)
2	19/9	Q&A for MOOC Lectures Exercise n° 2	(2hr)
3	26/9	Intro for Lab 1 Laboratory n° 1.1 + 1.2	(2hr)
4	3/10	Laboratory n° 1.3 + 1.4	(4hr)
5	10/10	Exercise n° 3	(2hr)
6	17/10	Exercise n° 4, 5	(2hr)
REPORT LAB 1: due on ~~October 28~~November 4, 2024, 16:30			
7	31/10	Exercise n° 6	(1.5hr)
8	7/11	Laboratory n° 2.0 – Data Collection	(1.5hr)
9	14/11	Exercise n° 7, 8	(1.5hr)
10	21/11	Laboratory n° 2.1	(1.5hr)
11	28/11	Laboratory n° 2.2	(4hr)
12	5/12	Exercise n° 9	(2hr)
13	12/12	Review before final exam	(1.5hr)
14	19/12	Final exam (no lab/exercise)	
REPORT LAB 2: due on January 6, 2025, 16:30			

The exact duration of the laboratories is tentative, and it can vary based on students' demand (more difficult labs might need more time than the easier ones).

NOTE : **Exercice location : CM 1105**
         Lab location : CM 1103