GHENT UNIVERSITY

Course Specifications

Valid in the academic year 2021-2022

Traffic Flow Modelling (E084390)

Due to Covid 19, the education and assessment methods may vary from the information displayed in the schedules and course details. Any changes will be communicated on Ufora.

Course size *(nominal values; actual values may depend on programme)*

Credits 6.0	**Study time 180 h**	**Contact hrs**	60.0h

Course offerings and teaching methods in academic year 2021-2022

A (semester 1)	English	Gent	seminar: coached exercises	30.0h
			lecture	30.0h

Lecturers in academic year 2021-2022

Fiems, Dieter	TW07	lecturer-in-charge
Wittevrongel, Sabine	TW07	co-lecturer

Offered in the following programmes in 2021-2022	**crdts**	**offering**
Bridging Programme Master of Science in Industrial Engineering and Operations Research	6	A
Master of Science in Industrial Engineering and Operations Research	6	A

Teaching languages

English

Keywords

Road traffic models; Intersection theory; Simulation.

Position of the course

Large cities suffer from significant congestion, especially during rush hour. To mitigate congestion, it is key that the conditions that lead to congestion are well understood. This course introduces mathematical and computer models that provide the necessary insight into causes of traffic congestion and explores how traffic management can be used to mitigate congestion. These models can capture the complex interactions that lead to congestion in simple and elegant ways. We discuss the fundamentals of traffic flow theory at the micro-, meso- and macroscopic level.

Contents

- Microscopic and macroscopic traffic flow variables: time-space diagrams, intensity, density, speed, delay, homogeneity and stationarity, measurement methods.
- Fundamental diagrams: speed-density diagram, flow-density diagram, speed-flow diagram, fundamental diagrams of Greenshields, De Romph, Wu, and Daganzo.
- Intersection theory: unsignalised intersection theory, signalised intersection theory.
- Microscopic models: safe-distance models, safe-distance models with delay, stimulus-response models, microsimulation.
- Macroscopic models: kinematic wave model, multiclass kinematic wave models, numerical methods for continuum models.
- Mesoscopic models: gas-kinetic models, hybrid models.
- Traffic demand models: trip generation, 4-step transportation model, multimodal transport.
- User choice: routing games, Wardrop equilibrium.

Initial competences

Elements of stochastic simulation

Final competences

1 To understand the main traffic descriptors
2 To design signalised and unsignalised intersections
3 To evaluate traffic scenarios by simulation
4 To select the most suitable models, methods and techniques to address specific congestion problems

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Lecture, Self-reliant study activities, Seminar: coached exercises

Learning materials and price

Course material: English syllabus + slides

References

- F. Kessels. Traffic Flow Modelling. Introduction to Traffic Flow Theory Through a Genealogy of Models. EURO Advanced Tutorials on Operational Research. Springer, 2019.
- Transportation Research Board. Highway Capacity Manual. TRB Publications, 2010.
- D. Ni. Traffic Flow Theory. Characteristics, Experimental Methods, and Numercal Techniques. Elsevier, 2016.

Course content-related study coaching

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Written examination with open questions

Examination methods in case of periodic assessment during the second examination period

Written examination with open questions

Examination methods in case of permanent assessment

Report

Possibilities of retake in case of permanent assessment

examination during the second examination period is possible in modified form

Extra information on the examination methods

During the semester, the students are asked to write a brief report for a small number of short assignments. If the totality of points they earn on these assignments influences the total points positively, these points are taken into account; otherwise only the points on the exam make up the total score of the students.

Calculation of the examination mark

Final score = 80%score PE+20% score NPE