Research School for Transport,
Infrastructure and Logistics

Course
Macroscopic Traffic Modelling

Date:	**8, 18, 23, 30 May & 13 June 2017**
Time:	**See program below**
Location:	**TU Delft (room t.b.a.)**
Course leader:	**Dr. Victor Knoop**
ECTS:	**1 (participation) - 2 (participation + assignment)**
TUD GS credits:	**3 (participation) - 5 (participation + assignment)**
Course fee:	**Free for TRAIL/Beta/OML members, others please contact the TRAIL office**
Registration:	**Via TRAIL website www.rstrail.nl**

Objectives
Traffic systems can be described by modelling every individual car (or cyclist, or pedestrian). These are microscopic simulation tools. Whereas they look convincing, in reality they are highly deceptive. Macroscopic simulation tools, describing traffic at a road level, are much more accurate if applied correctly. Moreover, they are much quicker in simulation. But how do these macroscopic models work?

This course aims to make the students aware of the various methods that exist to describe traffic operations macroscopically. Students learn techniques to describe where and when traffic jams occur and how traffic jams propagate.

Course description
The course discusses operational macroscopic traffic models. This means:
- operational: the scope is about traffic models describing how traffic patterns evolve over time and how congestion patterns grow. The demand pattern is taken exogenously;
- macroscopic: Traffic is considered as a traffic stream, so not as individual vehicles.

After following this course, the student is able to:
- describe traffic operations on a macroscopic scale;
- choose and program the macroscopic traffic model suiting his needs best.

Assignment
Write a chapter (relating to one of the lectures) of a course reader, and review a chapter of the reader.

Program
8 May: 13.30 – 16.30 h
Conservation equation
Fundamental diagram
Shockwave theory

18 May: 13.30 – 16.30 h
First order vs higher order: Payne, Generic Second Order Models (GSOM)
Cell Transmission Model
Lagrangian coordinates (tracking platoons, read by students)

23 May: 13.30 – 16.30 h
Traffic description in three planes: working with N, X, and T – (read by students)
Shockwave theory in NT

30 May: 13.30 – 16.30 h
Link transmission model (read by students)
Method of characteristics
Variational theory

13 June: 10.00 -16.00 h
Multi-class macroscopic modelling and Multi-dimensional macroscopic modelling
Specific wishes of students for topics can be incorporated here

Course material
Threefold:
1) Material provided by the lecturer
2) Scientific papers, suggested by the lecturer
3) A course reader, written by the students

Methodology
During the course, students are required to read several papers. The students will present one paper each, whereas the other theory will be presented by the lecturer. Students need to write one of the chapters (days) of the lecture notes and to review another day. Exercises will be provided, but are not compulsory.

Prerequisite
- Calculus: content-wise level of high school students, but applying it quickly (level: 1st year engineering studies).
- Basic traffic flow theory will be discussed briefly in the first lecture, including the fundamental diagram (https://ocw.tudelft.nl/course-lectures/3-fundamental-diagram-s-p-hoogendoorn/?course_id=8959) and shock wave theory (https://ocw.tudelft.nl/course-lectures/4-shockwave-theory-s-p-hoogendoorn/?course_id=8959).