Traffic State Estimation, Prediction and Control

Programme course

6 credits

Trafikflödesestimering, prediktion och styrning

TNK120

Valid from: 2019 Spring semester

Determined by
Board of Studies for Industrial
Engineering and Logistics

Date determined
2018-08-31

Main field of study

Transportation Systems Engineering

Course level

Second cycle

Advancement level

A1X

Course offered for

- Communication and Transportation Engineering, M Sc in Engineering
- Master's Programme in Intelligent Transport Systems and Logistics

Prerequisites

Basic knowledge about traffic theory and planning and simulation of traffic.

Intended learning outcomes

Traffic state estimation and prediction are essential components of traffic information and control systems. The purpose of this course is to provide basic knowledge in the area of traffic estimation, prediction and control, and give insight on how traffic control can be used for improving the efficiency of traffic systems and reducing the environmental impact from car traffic in urban areas. Furthermore will the course introduce dynamic network wide modeling of traffic, and give insight in the underlying theory of dynamic user equilibrium models.

After the course, the student shall be able to:

- Describe and utilize filtering methods on heterogeneous traffic data, for traffic state estimation purposes
- Describe and utilize basic data driven method for traffic state prediction
- Formulate and utilize macroscopic traffic flow simulation models for traffic analysis
- Describe and apply traffic control strategies for motorways
- Describe and utilize dynamic traffic assignment models for evaluating and analyzing traffic management and control systems
- Describe and utilize methods for evaluating traffic impact on the environment
- Describe different types of traffic models' advantages, disadvantages, and suitability for analyzing different types of traffic facilities and traffic control and management systems for urban networks
- Discuss and analyze the relevance of the course and the course content in relation to the scope of the master program that the student are taking and in relation to a future working career as a traffic engineer

Course content

- Introduction to traffic state estimation
- Filtering and assimilation of heterogeneous traffic data
- Introduction to data driven traffic state prediction
- Macroscopic traffic simulation
- Traffic control on motorways
- Introduction to dynamic traffic network assignment and mesoscopic traffic simulation
- Experiments with dynamic network assignment models
- Application of dynamic traffic assignment methods to traffic management problems
- Emission modeling

Teaching and working methods

The course consists of lectures, seminars and laboratory work.

Examination

LAB1	Laboratory Work	3 credits	U, 3, 4, 5
UPG1	Individual Assignments	3 credits	U, 3, 4, 5

Grades

Four-grade scale, LiU, U, 3, 4, 5

Department

Institutionen för teknik och naturvetenskap

Director of Studies or equivalent

Erik Bergfeldt

Examiner

Joakim Ekström

Education components

Preliminary scheduled hours: 44 h
Recommended self-study hours: 116 h

Course literature

Books

Treiber, Martin, Kesting, Arne, (2013) *Traffic Flow Dynamics. Data, Models and Simulation* Berlin, Heidelberg : Springer Berlin Heidelberg : Imprint: Springer, 2013.
ISBN: 9783642324604, 9783642324598

Other

Additional material available at the course web.