



FA33001 Transport Modelling: Advanced Course 7.5 credits

Transportmodellering: Avancerad kurs

This is a translation of the Swedish, legally binding, course syllabus.

If the course is discontinued, students may request to be examined during the following two academic years

Establishment

The course syllabus is valid from spring term 2024 according to the Head of school decision: A-2023-2810, 3.2.2 Beslutsdatum: 2023-12-10

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Admission to relevant doctoral program: Approved courses of at least 60 higher education credits at the basic level in the subject areas of transportation systems, civil engineering, urban planning, economics, computer science, physics, applied mathematics, or other subjects deemed directly relevant. Proficiency in English equivalent to English 6.

Language of instruction

The language of instruction is specified in the course offering information in the course catalogue.

Intended learning outcomes

- Exhibit an in-depth knowledge of the fundamental principles of discrete choice theory and proficiently apply them in transportation demand modeling, including both trip-based and activity-based methodologies.
- Articulate the fundamental assumptions of rational choice theory, expected and subjective utility theory, as well as behavioral economics, and critically analyze their application in applied demand modeling for transportation.
- Describe the underlying statistical theory for the estimation of travel demand models. Develop and estimate flexible econometric demand models based on discrete choice modeling. Account for the theory of and methods for estimation of discrete choice models using simulation and their applications.
- Estimate transportation demand models on realistic data with large choice sets, and communicate and interpret the results.
- Describe and apply statistical theory and techniques for model selection, interpretation, and validation, including goodness-of-fit measures, cross-validation, and out-of-sample prediction.
- Explain the basic theory of Bayesian estimation of hierarchical models. Formulate and estimate a Hierarchical Bayesian model for multinomial choices.
- Discuss the approach in econometrics, and the similarities and differences with approaches in machine learning, as applied to models for demand forecasting.
- From a theoretical perspective, discuss the application of the four-step model for simple policy analysis, describe its data requirements and output. Discuss its advantages and limitations.
- Describe and in simple applications use network equilibrium and traffic assignment theory for car and public transport.
- Apply transport demand model to analyze integrated transport and land use measures and evaluate them in terms of definitions of sustainability, including the dimensions of ecological, economic, and social sustainability.
- Critically, creatively, and independently formulate relevant complex societal challenges, and how these can be modeled for evaluation in terms of ecological, economic, and social sustainability.

Course contents

Main content of the course includes: Theoretical foundation of discrete choice modelling, and core theoretical concepts of rational choice theory and behavioural economics. Estimation of flexible discrete choice models including simulation methods and large choice sets and Hierarchical Bayes, with a focus on transport demand. Theoretical approach of econometrics vs Machine Learning, as applied to forecast travel demand. Theory for accessibility analysis, theoretical framework for the four-step model and its variants, traffic assignment for cars and public transportation, models for integrated analysis of transportation and land use, application of travel demand models for evaluating policy measures directed at transportation and land use.

Examination

- EXA1 - Oral exam, 2.0 credits, grading scale: P, F
- SEM1 - Seminars, 1.5 credits, grading scale: P, F
- TEN1 - Written exam, 2.0 credits, grading scale: P, F
- TEN2 - Written exam, 2.0 credits, grading scale: P, F

Based on recommendation from KTH's coordinator for disabilities, the examiner will decide how to adapt an examination for students with documented disability.

The examiner may apply another examination format when re-examining individual students.

The examiner may, based on a recommendation from KTH's coordinator of support for students with disabilities, decide on any adapted examination for students with documented, permanent disabilities.

The examiner may allow an alternative form of examination for re-examination of individual students.

Other requirements for final grade

Participation in seminars is mandatory. The examiner may allow alternative form of examination in cases of absence from no more than 20% of the seminars.

Ethical approach

- All members of a group are responsible for the group's work.
- In any assessment, every student shall honestly disclose any help received and sources used.
- In an oral assessment, every student shall be able to present and answer questions about the entire assignment and solution.