



# FMF3035 System thinking and modelling of complex dynamic systems 6.0 credits

Systemtänkande och modellering av komplexa dynamiska system

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

## Establishment

On 18/12/2020, the Dean of the ITM School has decided to establish this official course syllabus to apply from spring term 2021 (registration number M-2020-2682).

## Grading scale

P, F

## Education cycle

Third cycle

## Specific prerequisites

Admitted to PhD studies in a relevant field.

## Language of instruction

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

# Intended learning outcomes

The course gives the students an introduction to systems thinking and modelling of complex dynamic sociotechnical systems by using the methodology System Dynamics.

After the course, the student should be able to:

1. Describe central terms and concepts within system thinking
2. Use these concepts to describe events, phenomena, and structures from the real world,
3. Understand and explain basic system archetypes, including which system behavior that these causes.
4. Describe and analyze systems from a sustainability perspective.
5. Understand how System Dynamics can be used to model information flows and mental models, and to evaluate policies.
6. Build, validate and analyze System Dynamics models by using Vensim (or another similar software)
7. Formulate complex dynamic problems, and analyze them by using System Dynamics
8. Argue for the results validity
9. Use system thinking and System Dynamics modelling to communicate results to stakeholders and actors

# Course contents

The course includes literature studies, lectures, seminars (discussions), hand-in exercises, a project work, and presentation. During the course, the students will continuously give feedback on each other's work. Course literature comprises standard literature within the field as well as recent research articles.

Areas covered:

- Formulation of dynamic problems
- Fundamental concepts within system thinking and system design (e.g. causality, Little's Law, feedback)
- Causal Loop Diagrams
- Mental models
- System structures and system archetypes
- Naming convention and "good practice" with modelling with system dynamics.
- The modelling process
- Validation of system dynamics modell
- Communication using system dynamics models

# Examination

- INL1 - Hand in exercise, 2.0 credits, grading scale: P, F

- SEM1 - Seminars, 0.5 credits, grading scale: P, F
- PRO1 - Project, 3.0 credits, grading scale: P, F
- SEM2 - Seminars, 0.5 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.

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

## Other requirements for final grade

To pass the course, attendance at at least 80% of seminars is required.

## 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.