



Faculty of Health, Science and Technology
Electrical Engineering

Syllabus

Modeling and Simulation of dynamic systems

Course Code:	ELGB15
Course Title:	Modeling and Simulation of dynamic systems <i>Modellering och simulering av dynamiska system</i>
Credits:	7.5
Degree Level:	Undergraduate level
Progressive Specialisation:	First cycle, has at least 60 credits in first-cycle course/s as entry requirements (G2F)

Major Field of Study:
ETA (Electrical Engineering)

Course Approval

The syllabus was approved by the Faculty of Health, Science and Technology 2026-01-28, and is valid from the Spring semester 2026 at Karlstad University.

Prerequisites

Previously registered in Circuit analysis (7.5 credits) or Circuit analysis 1 (7.5 credits), Mathematics for engineers III (7.5 credits) and Industrial sensor technologies and automatic control (7.5 credits) or Automatic control (7.5 credits). An equivalence assessment can be made.

Learning Outcomes

Upon completion of the course, students should be able to:

1. give an account of basic concepts related to the modeling and simulation of dynamic systems,
2. assess the usefulness and limitations of different methods for modeling dynamic systems,
3. explain the technique of modeling a dynamic system using physical modeling and apply it to simple cases,
4. describe the process of modeling a dynamic system using system identification and apply the steps of this process to simple cases, and
5. use software to model and simulate dynamic systems.

Content

Different types of models and mathematical descriptions of dynamic systems: Physical models, grey box models, black box models, continuous-time models, discrete-time models, differential equations, difference equations, state space forms, representations in the frequency domain, and simple disturbance models.

Physical modeling of dynamic systems: Basic physical relationships for dynamic systems and analogies between different kinds of physical systems.

Introduction to system identification for modeling dynamic systems: Choice of model structure, adaptation of the model to the data, and model validation.

Simulation of models of dynamic systems: Simulation of models in state space form.

Reading List

See separate document.

Examination

Assessment is based on an on-campus written exam and written reports.

If students have a decision from Karlstad University entitling them to Targeted Study Support due to a documented disability, the examiner has the right to give such students an adapted examination or to examine them in a different manner.

Grades

One of the grades Pass with Distinction (VG), Pass (G), or Fail (U) is awarded in the examination of the course. Engineering students are awarded one of the grades Pass with Distinction (5), Pass with Some Distinction (4), Pass (3), or Fail (U).

Quality Assurance

Follow-up relating to learning conditions and goal-fulfilment takes place both during and upon completion of the course in order to ensure continuous improvement. Course evaluation is partly based on student views and experiences obtained in accordance with current regulations and partly on other data and documentation. Students will be informed of the result of the evaluation and of any measures to be taken.

Course Certificate

A course certificate will be provided upon request.

Additional information

The local regulations for studies at the Bachelor and Master levels at Karlstad University stipulate the obligations and rights of students and staff.