Course syllabus

Matematisk modellering
Mathematical Modelling

FMAB40, 4 credits, G1 (First Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED F/Pi
Date of Decision: 2023-04-18

General Information

Main field: Technology.
Compulsory for: Pi1
Language of instruction: The course will be given in Swedish

Aim

The aim of the course is to give awareness of the problems of mathematical modelling, i.e., what it means to create quantitative models which can give understanding of phenomena in reality. A further aim is that the student should learn to master some general tools and structures which can be used in modelling, and learn engineering ways of thinking. The course should also show how knowledge from the courses that the student studied during the first year may be used for practical modelling. Furthermore, the course should develop the student's abilities in oral and written presentation.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to clearly explain and use the basic concepts of mathematical modelling, in particular be able to explain what a mathematical model is.
- be able to describe and informally explain the process of mathematical modelling, including identification of the problem, formulation, analysis, computation, simulation and feed-back.

Competences and skills
For a passing grade the student must

be able to, independently or in a group, apply the mathematical modelling process on simple and realistic, but vaguely formulated problems, of which some are connected to environmental issues. More specifically, the student should show good ability to:

- identify and judge how different factors affect a system,
- formulate a problem in mathematical terms, equations and constraints,
- judge the validity and limitations of a model, and how it can be refined,
- analyse and carry out simple simulations on a model,
- consider and interpret the solution model in relation to the original problem, and judge the validity and limitations of the solution.

in writing as well as orally, with proper terminology, in a well-structured manner and with clear logic be able to explain the solution to a modelling problem.

Judgement and approach
For a passing grade the student must

- develop an attitude to the world around us and mathematics, where the use of mathematics in quantitative descriptions of reality seems natural and possible.
- be able to tolerate redundance in or missing data, and in such cases to have an engineering attitude in making considerations.

Contents

Modelling: The couplings between model and reality. Validation of a model. Some modelling tools. Simulations using Matlab.

Examination details

Grading scale: UG - (U,G) - (Fail, Pass)
Assessment: Written and oral reports of project work, carried out individually and in groups. Compulsory attendance at the project reports. All the projects must be approved during the current academic year. Thus one may not save results on single projects till a later year.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: Linear algebra. Calculus in one and several variables. Programming.
The number of participants is limited to: No
The course overlaps following course/s: FMA045, FMAA10

Reading list

- K. Åström & G. Sparr: Matematisk modellering. Matematikcentrum, 2005. Provided

by the department.

Contact and other information

Course coordinator: Studierektor Anders Holst, Studierektor@math.lth.se
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