AL2135 Environmental Modelling: Introduction with Application Examples 7.5 credits

Miljömodellering: Introduktion med applikationsexempel

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

Establishment

Course syllabus for AL2135 valid from Autumn 2013

Grading scale

A, B, C, D, E, FX, F

Education cycle

Second cycle

Main field of study

Environmental Engineering, Mechanical Engineering

Specific prerequisites

At least 150 academic credits (ECTS) in a program of engineering or natural science or the course MJ1502 or MJ1500 or equivalent.

Language of instruction

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

Intended learning outcomes

The course is intended to give introductory knowledge and an overview of methods for environmental modelling and its purposes. The course is also intended to give introductory knowledge and experience in model construction and evaluation. You will also practice your skills in communicating environmental modelling. The application examples may illustrate water quality issues, but also touch upon modelling of global and local element cycles and ecosystem modelling and different types of sustainability issues. After finishing the course, the student should be able to

- Describe the main aims and parts of Environmental Modelling;
- Describe the key concepts within Environmental Modelling, for example calibration, verification, validation, robustness, model error, oscillation, discretization, and to distinguish between deterministic and stochastic models, as well as static and dynamic models;
- Identify dominant processes and carry out sensitivity analyses and uncertainty analyses, as well as describe their role in Environmental Modelling;
- Mathematically formulate mass-balances for environmental modelling purposes and for simple systems solve those analytically of numerically (using EXCEL or SIMILE or similar modelling tools) for steady-state and dynamic conditions (difference equations/differential equations);
- Generate model output (for selected models) that can be used for testing of models and to understand the modelled system or propose management of the system and analyse the output in a relevant and useful way ;
- On an introductory level use one or more numerical tools (for example PHREEQC, MEDUSA/HYDRA or ORWARE, SIMILE) for environmental modelling;
- Put up, use, and interpret a mathematical model for material cycling in ecosystems and the dynamical aspects of ecological systems, including logistic growth, carrying capacity, and oscillation;
- Understand written descriptions of environmental modelling and on a basic level evaluate such models;
- On an introductory level, communicate environmental modelling for different users, and describe the role of environmental modelling within research and development, environmental issues (including risk) and policy issues.

Course contents

Fundamentals of environmental modelling and mathematical quantification

Fundamental definitions and principles of model constructions

Causality modelling

General formulation of mass balances and their applications within environmental modelling

Application of environmental modelling to a selected subject

Training in the use of numerical modelling tools

Practice in reading environmental modelling texts and manuals and in evaluating modelling work

Project work within environmental odelling

Examination

- PRO1 - Project, 3.0 credits, grading scale: A, B, C, D, E, FX, F
- RED3 - Assessment, 1.0 credits, grading scale: A, B, C, D, E, FX, F
- RED1 - Assessment, 2.0 credits, grading scale: A, B, C, D, E, FX, F
- RED2 - Assessment, 1.5 credits, grading scale: A, B, C, D, E, FX, 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.

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.