FSD3136 Numerical Methods for Sound Propagation I 6.0 credits

Numeriska metoder för ljudutbredning I

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

Course syllabus for FSD3136 valid from Autumn 2018

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

MSc within vehicle engineering, physics or an education corresponding to those are required for eligibility.

Language of instruction

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

Intended learning outcomes

The learning outcomes of the course are that the student should be able to:

- Derive the basic acoustic equations for homogenous media (the linear acoustic equations, the wave equation and Helmholtz equation) from conservation of mass and momentum.
- Give a general overview of different numerical approaches to solve the Helmholtz equation in non homogenous media and describe their basic assumptions and respective strengths and weaknesses.
- Possess basic knowledge of source modelling for computing sound propagation in atmosphere and in underwater applications.
- Implement Helmholtz equation solvers, for instance Ray tracing, Normal modes, Wavenumber integration and Parabolic equation techniques and compare the results to analytical results or benchmark cases.
- Model boundary conditions in atmospheric and under water acoustics and numerical implementations of these in different algorithms.
- Compare different numerical schemes with respect to robustness, computational times, memory allocation and accuracy.

Course contents

The course covers different numerical methods for computing long range sound propagation in non-homogenous media (air and water). Students will implement basic numerical schemes for different environments and analyse and compare the results from different propagation codes.

Disposition

Seminars discussing the literature as well as hand-in exercises will be held. The examination of students will be performed by an oral exam and by evaluating hand-in exercises and active participation in the seminars.

Course literature

Läsanvisningar från följande böcker samt utvalda vetenskapliga artiklar utgör kurslitteraturen:

E. Salomons, Computational atmospheric acoustics, Kleuwer, 2003

F. B. Jensen et al, Computational ocean acoustics, Springer, 2011

Equipment

Computer

Examination

- PRO1 - Project work, 4.0 credits, grading scale: G
- TEN1 - Exam, 2.0 credits, grading scale: G

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 examination of students will be performed by an oral exam and by evaluating hand-in exercises and active participation in the seminars.

Other requirements for final grade

Active participation in the seminars. Passed on oral exam and passed hand-in exercises.

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.