FSD3130 Theoretical Acoustics I 9.0 credits

Teoretisk Akustik 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 FSD3130 valid from Autumn 2017

Grading scale

Education cycle

Third cycle

Specific prerequisites

Masters degree in mechanical engineering, vehicle engineering, engineering physics or equivalent. Documented knowledge of English corresponding to English B / English 6.

Language of instruction

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

Intended learning outcomes

Students graduating from the course should:

- Have knowledge about the division of acoustics as a scientific field and the historical development of acoustics.
- Be able to derive the classical wave equation and understand underlying assumptions and limitations.
- Have knowledge about concepts and methods for describing and analysing acoustic fields.
- Be able to apply multipole-expansion methodology and understand the character and importance of lower order point sources (monopole, dipole, quadrupole).
- Be able to derive the Kirchhoff-Helmholtz integral and understand its applications.
- Understand the reciprocity principle and the influence of different types of boundaries in the source region.
- Have knowledge about different relaxation processes and related non-linear dissipation of sound.

Course contents

The course covers all aspects of classical acoustics with focus on sound propagation in fluids. The fundamental equations of continuum mechanics are first derived, and from this the equations governing classical acoustics are derived. In particular, scattering at interfaces between media with different properties and from solid bodies is discussed. Acoustic waves generated and scattered from vibration bodies with rigid and impedance boundary conditions are covered. Methods for low and high frequency solutions are introduced such as multipole expansion for low frequencies and ray methods for high frequency acoustics. The Kirchhoff- Helmholtz equation is derived and applied to scattering and diffraction problems. The effect of viscous and thermal losses and molecular relaxation processes are addressed.

Course literature

Acoustics - An introduction to its physical principles and applications, A.D. Pierce

Examination

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.

Other requirements for final grade

Participation in course seminars, assignments, and oral exam.

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.