FSD3100 Material Acoustics I 7.5 credits

Materialakustik 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 FSD3100 valid from Autumn 2018

Grading scale

P, F

Education cycle

Third cycle

Specific prerequisites

Basic numerical methods and finite element formulations, assumed as background.

Basic and material mechanics, assumed as background.

Basic acoustics, assumed as background.

Language of instruction

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

Intended learning outcomes

The student should after completing the course be able to:

- Formulate and understand models for the acoustical behavior of different types of materials, such as compressible and nearly incompressible solids; cellular, porous and fibrous materials with open structure, inhomogenoeus materials and the associated structural scales.
- Work with mathematical and numerical models of elastic, acoustic, anelastic, viscous mechanisms in materials as well as different types of interaction phenomena of importance for the acoustic characteristics. In this part studies of methods for homogenisation as well as phenomenological scaling models used in qualitative descriptions of acoustic effects occurring at different levels of physical scales of relevance.
- Understand the meaning and effects of different types of boundary and coupling conditions in different applications where acoustic materials play an important role.
- Set up and perform simulations and analyse problems where the acoustic material properties are important, using different types of solution techniques, e.g. transfer matrix, finite elements, etc. and using Matlab, Comsol, as well as general commercial software.

Course contents

The course material is covered in different parts. A set of homework tasks will be given, cf. below. The assignments can be handled individually or in groups of two.

The objective of the course is to give a deeper understanding of the acoustics of different types of materials. In particular, the course will emphasize general phenomenological modelling, including computer-based formulations and procedures, related to dynamical, frequency dependent material behavior, the response and their mathematical models. Models will be studied at different levels of complexity, from simplified analytical up to large discretized models are considered. Models based on wave decompostions, finite element solutions and other numerical approaches are studied.

Course literature

- Allard, J. F., & Atalla, N. (2009). Propagation of Sound in Porous Media-Modelling Sound Absorbing Materials.
- L.J.Gibson, M.F.Ashby, Cellular Solids-Structure and Properties, second ed.,Cambridge University Press, Cambridge, 1997 First published by Pergamont Press Ltd., 1988.
- Carclone JM. Wave Fields in Real Media: Wave Propagation in Anisotropic, Anelastic, Porous and Electromagnetic Media. Handbook of Geophysical Exploration, Section I. Seismic Expoloration (2nd edn), vol. 38. Elsevier: Amsterdam. ISBN-10 0-08-046408-4.

Examination

- PROA - Project work, 7.5 credits, grading scale: P, 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.

Other requirements for final grade

The participants are, for full credits, required to complete the following:

- Three homeworks; as delivered during the course .

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.