SD2185 Ultrasonics 6.0 credits

Ultraljud

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

Establishment

Course syllabus for SD2185 valid from Autumn 2007

Grading scale

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

Education cycle

Second cycle

Main field of study

Specific prerequisites

Basic courses in mathematics, mechanics and noise control.

Language of instruction

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

Intended learning outcomes

After the course the students should be able to:

- Derive the wave equation and find its plane wave solutions in infinite, anisotropic solids, isotropic semi-spaces, a planar wave guides.
- Formulate the boundary conditions associated with interfaces between solid-vacuum, solid-liquid, and solid-solid. Solve the related problem.
- Use, at least qualitatively, the main concepts of scattering theory to describe the interaction between waves and defects.
- Select the wave mode which is most appropriate for a given type of inspection. Select the appropriate transducer and experimental set-up to generate the mode.
- Inspect solid materials and provide a qualitative interpretation of the inspection results

Course contents

Elements of elasticity: strain and stress tensors, work, internal energy, generalized Hooke's law. Propagation of bulk waves in isotropic and anisotropic solids: Christoffel equation, slowness surface; energy conservation and Poynting vector; group velocity. Rayleigh and Lamb waves: general properties of these modes and of their dispersion relations. Interaction of ultrasonic waves with perfect and damaged interfaces: boundary conditions; reflection and transmission. Radiation and Scattering: introduction to Green's functions, radiation by a piston, Lommel integral, elements of scattering theory. Introduction to Nondestructive Evaluation (NDE): examples of material characterization by mean of ultrasonic waves.

Course literature

Ultrasonic Waves – Fundamentals and Applications', J. David & N. Cheeke, CRC, Series in Pure and Applied Physics, CRC Press

Class notes

Examination

- INL1 - Assignments, 3.0 credits, grading scale: P, F
- TEN1 - Examination, 3.0 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.

Other requirements for final grade

Oral examination (TEN1; 3 university credits), Assignments (INL1; 3 university credits).

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.