

*Course syllabus*

# Akustik Acoustics

**VTAN01, 7,5 credits, A (Second Cycle)**

**Valid for:** 2023/24

**Faculty:** Faculty of Engineering, LTH

**Decided by:** PLED V

**Date of Decision:** 2023-03-21

## General Information

**Elective for:** F4, V4-hb, V5-ko

**Language of instruction:** The course will be given in English

## Aim

The purpose of the course is to provide knowledge about sound propagation in different media, namely fluids such as air and water as well as solid media such as structural elements, where different wave types and their properties are introduced. Examples of relevant applications are Building Acoustics and Vehicle Acoustics (e.g. car, boat and aircraft).

## Learning outcomes

*Knowledge and understanding*

For a passing grade the student must

- Be able to describe the physical foundations and equations for waves in solid materials and wave propagation in infinite elastic media and structures.
- Be able to explain basic concepts of sound propagation such as acoustic power, intensity, impedance and mobility.
- Be able to describe different damping mechanisms and methods for experimental determination of damping, as well as know how to change the damping properties of a structure.
- Be able to explain interaction between fluid and structure such as reflection, transmission and sound radiation.
- Be able to name and identify calculation methods such as SEA and FEM.

### *Competences and skills*

For a passing grade the student must

- Be able to calculate natural frequencies, natural modes and mode density.
- Be able to calculate wave propagation in fluids and structures to describe reflection, transmission, impedance and mobility.
- Be able to calculate sound radiation from structures.
- Be able to describe an acoustic problem, carry out calculations, report these and analyze and discuss the problem and the solution in a technical report.

### *Judgement and approach*

For a passing grade the student must

Be able to critically evaluate and assess technical solutions, measurement methods and calculation methods as well as their applicability through opposition.

## Contents

- Wave types and propagation in fluids, solids and structures.
- Mobility and impedance.
- Transmission, reflection and interaction, between different materials and geometries.
- Sound radiation from surfaces.
- Damping in solids and structures.
- Structural dynamic response for different types of excitation.
- Statistical Energy Analysis (SEA).
- Finite element analysis (FEA).
- Sound propagation in volumes.
- In-depth project with application to either Building Acoustics or Vehicle Acoustics.

## Examination details

**Grading scale:** TH - (U,3,4,5) - (Fail, Three, Four, Five)

**Assessment:** Passed written theory test, and passed project report and presentation.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

## Admission

**Admission requirements:**

- FMAB30 Calculus in Several Variables

**The number of participants is limited to:** No

**The course overlaps following course/s:** VTA016, VTA060, VTAF05

## Reading list

- A Nilsson, B Liu: Vibro-Acoustics. Springer, 2016. Freely available as E-book for LU students.

## Contact and other information

**Examinator:** Peter Persson, [peter.persson@construction.lth.se](mailto:peter.persson@construction.lth.se)

**Course homepage:** <http://Canvas>