



# DT2212 Music Acoustics 7.5 credits

## Musikakustik

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

The official course syllabus is valid from the autumn semester 2021 in accordance with Head of School decision: J-2021-0878. Decision date: 15/04/2021

## Grading scale

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

## Education cycle

Second cycle

## Main field of study

Electrical Engineering

## Language of instruction

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

## Intended learning outcomes

After completing the course you should be able to

- explain the acoustical function of musical instruments and the singing voice from basic physical principles
- calculate and measure basic acoustical properties of musical sounds and instruments
- design and calculate the dimensions of prototypes for string and wind instruments
- describe and use different methods for modelling of musical instruments and for synthesis of musical sounds
- apply basic laws of room acoustics to calculate sound levels, decay time, and reflection patterns and relate them to the influence of the room on the perception of music
- extract and present the main content of a selection of scientific articles on music acoustics

## Course contents

**Acoustics:** Wave equation, plane and spherical waves, electrical-acoustic-mechanical analogies. Eigenmodes, strings, membranes, and pipes. Fourier transforms and spectra.

**Auditory Perception:** The physiology of the ear. Frequency and pitch, vibrato. Amplitude and loudness. Masking. Spectrum, timbre, roughness. Perception of sound structures.

**Musical instruments:** Mechanical design. Principles of excitation source spectrum, feedback and spectral shaping by resonators. Spectral contents in steady-state and transients. Sound radiation. Brass, woodwind, strings, piano, organ, singing. Numerical synthesis.

**Scales and Tuning:** Equal temperament, Pythagorean and just tuning. Measurements on performed music, pure and stretched octaves.

**Room Acoustics:** Basic concepts, sound propagation in rooms, binaural hearing, artificial head stereophony.

**Modelling and Computer Music:** Synthesis methods. Physical modelling, control parameters.

## Specific prerequisites

### Examination

- LAB1 - Laboratory Work, 1.5 credits, grading scale: P, F
- PRO1 - Project, 1.5 credits, grading scale: P, F
- TEN1 - Examination, 4.5 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.

## Other requirements for final grade

One written examination, laboratory course, project work.

## 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.