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

Course syllabus for DT2212 valid from Spring 2019

Grading scale

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

Education cycle

Second cycle

Main field of study

Electrical Engineering

Specific prerequisites

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.

Course literature

Donald Hall: Musical Acoustics, 3rd ed. Brooks/Cole, 2002.

Kompletterande kurskompendium, KTH-TMH, 2005.

Rekommenderad bredvidläsning

Fletcher N.H. & Rossing T: The Physics of Musical Instruments, 2nd ed. Springer-Verlag, 1998.

Barron M: Auditorium Acoustics and Architectural Design, E & FN Spon, 1993.

Yost W: Fundamentals of Hearing, Academic Press, 2000.

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.

In this course all the regulations of the code of honor at the School of Computer science and Communication apply, see: http://www.kth.se/csc/student/hederskodex/1.17237?l=en_UK.

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.