Room Acoustics, LP III 2024

Chalmers, Applied Acoustics

***General*:**	Number of points: 7.5. The course consists of a series of seminars and group work
Literature:	Building Acoustics by Tor Erik Vigran
	Concert Halls and Opera Houses - Music, Acoustics, and Architecture by Leo Beranek
	Room Acoustics by Heinrich Kuttruff
	Architectural Acoustics by Long
	Lecture notes by Peter Svensson
Teacher:	Wolfgang Kropp
Room:	TA lecture hall / Division of Applied Acoustics

Learning outcome: (after completion of this course, the student should be able to):

- Solve typical problem in the field of room acoustics
- Successfully carry out a project from a design task to a finished proposal given typical constraints and tools
- Apply an holistic approach to engineering, obtaining insight into the strong interconnections among different areas of interest in the building process of venues for voice and music, and to give social response by discussions with architects, musicians and others involved in the building and planning process
- Understand and explain how humans are affected by multi-sensory data, i.e. the complex interaction between aural, tactile and visual stimuli.
- Search information using various library data retrieval tools.
- Describe the desired room acoustics in terms of subjective criteria, and to convert such subjective criteria into measurable quantities for example reverberation time, clarity, etc.
- Give advice on the design of a room by predicting the effect of different geometries and surface materials, speaker/musician & audience positions, as well as using available knowledge and computer software.
- Apply available knowledge and the right tools to predict sound propagation in rooms, such as geometrical acoustics software.
- Apply modern measurement software and equipment (MLSSA, Room Capture, FuzzMeasure) to validate calculated room acoustics properties by comparison to measured ones.
- Estimate which deviations from set room acoustic goals that may be audible and critically evaluate the accuracy of room acoustic measurement.
- Work in project teams with architects to solve architectural acoustics problems for new or existing buildings

Course organisation

To increase participation and interaction among students and between teacher and students the structure of the course is changed substantially. The course is organised as follows:

Lectures

A series of ordinary lectures are given (see our common schedule)

Seminars

Seminars where we together discuss the course material. This demands

- that you prepare yourself by reading relevant material and
- that you together prepare a short presentation with the results of your homework (5-10 minutes)
- that you actively participate in the discussion during the seminar.

To prepare the seminars demands also smaller groups of students of 4-5 students

Please built groups of two by your own choice. For this visit the Canvas page for the course and go to "People". There you can create your groups. Deadline: 20/1 2023.

The topics of the seminars will be decided together. Times for the seminars will be decided together.

Thematic blocks

The course is divided in the following thematic blocks (with main literature)

- Demands in room acoustics and building acoustics (Beranek)
- Listening to rooms - the impulse response function (Vigran, Kuttruff)
- Subjective and objective descriptors of room and building acoustics (Beraknek, Vigran)
- Reflections, wall impedance and absorbers (Vigran)
- Finite size reflectors and scatterer, diffraction (Svensson)
- Planning the acoustic properties of rooms and buildings (Beranek, Kuttruff)
- Room acoustic modelling, image sources, ray tracing, energy description (Kuttruff, Svensson)
- Sound insulation, walls, floors and windows (Vigran)
- Wooden buildings (Thorsson)
- Prediction methods in building acoustics (Vigran)
- Vibration isolation of buildings
- Sound transmission in buildings (Vigran)
- Measurement techniques in room acoustics and building acoustics

Seminar times

These are given in the TA schedule 2-3 weeks in advance.

2024 Student Design Competition

Students in Sound and Vibration will participate together with students in the AT programme in the **2024 Student Design Competition** sponsored by the Acoustical Society of America's Technical Committee on Architectural Acoustics and the National Council of Acoustical Consultants, in conjunction with the Newman Student Award Fund. More details to this later on since the information is not online yet, but you might already have a glance at previous years (http://www.newmanfund.org/student-design-competitions).

Literature:

The following books are the main part of the course literature

- Building Acoustics by Tor Erik Vigran,
- Concert Halls and Opera Houses - Music, Acoustics, and Architecture by Leo Beranek
- Room Acoustics by Heinrich Kuttruff
- Architectural Acoustics by Long

These books are either available as e book for download or for electronic reading at Chalmers library.

Additional material is available at www.ta.chalmers.se

Exam: Oral exam

Beside the lectures/seminars there are additional dates related to the cooperation with the architects and the competition. This will include scheduled supervisions in groups as well as at least two occasions with "critique".

First meeting with AT students a presentation of concepts: 23/2 2024 (place to be decided)

Prototype seminar: 13-15 March 2024 (place and exact organisation not clear)

Final critique: 26/4 2024 (whole day, place to be decided)