

Sound Studies and Sonic Arts

Summer Semester 2021

Phase Focus

Module Listening

Course Title Psychoacoustics, Sound Creation and Coding | Lecture

Course Times and Location Fridays, 3:00-7:00 p.m. + Saturdays 10:00 a.m.-2:00 p.m. | LIE314/online/tba - see schedule

Instructors [Prof. Dr. Thomas Sporer](#)

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Office Hours and Location upon request

Course Description

This lecture covers three topics which are closely related:

Psychoacoustics is a discipline which tries to describe the perception of sound. In contrast to the physiology of hearing it is not targeting to explain the function of each part of the ear, but to measure the whole auditory sense respective what we are able to hear, to distinguish and to rank. In the lecture the principles of one- and two-ear listening are explained and demonstrated with audio examples. An important topic will also be the assessment of perceived quality, both with listening tests but also with measurement systems modelling human perception. In the part about **sound creation** we will look into the basis of speech, organ pipes and strings. Starting with natural physical systems we will also explain some basics about computer models for sound creation. Again, we are not producing for computers and measurement systems, but for human beings, and perceived quality is the key goal.

Finally, the two parts “creation” and “perception” are brought together: **Speech coders**, like those in mobile phones, and **audio codecs**, like MP3 and AAC, exploit both properties of the source and the receiver. This part will also give hints about what to do and not to do when producing audio which might be coded.

Format: This is a lecture with some additional experiments to give hands-on experience. Students are invited to contribute with questions, observations and by telling own experience.

Target Audience: Everybody who wants to **understand** the human auditory sense might be interested. Everybody **producing** audio and using coding schemes should be interested. The lecture sometimes will also show some mathematical equations, but to understand these is only necessary if you want to program yourselves. Finally, you should be able to benefit from the knowledge even if you are only in front of a mixing console or audio workstation.

Requirements for attending

The lectures will build on each other. Therefore, it is necessary to attend regularly.
Maximum of 22 students.

Exam / Credit Points

2CP (non-graded: Listening): regular attendance. If you are missing more than one class, you need to take an oral exam on June 25 on the classes you missed.

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Consecutive assignment leading to 4CP (graded: Listening, grading: only the consecutive assignment is graded):
written exam 25 June 2020 | 10:00 a.m. -1:00 p.m.

Schedule

Fri	6 May	15:00 – 19:00	Introduction, digital audio (ONLINE)
Fri	20 May	15:00 – 19:00	Psychoacoustics I (LIE314)
Sa	21 May	10:00 – 14:00	Psychoacoustics II (LIE314)
Fri	3 June	15:00 – 19:00	Psychoacoustics III (LIE314)
Sa	4 June	10:00 – 14:00	Psychoacoustics IV and Audio Quality (LIE314)
Fri	24 June	15:00 – 19:00	Sound Creation (location tba)
Sa	25 June	10:00 – 14:00	Speech and Audio Coding (location tba)

Supporting Media

Fastl, Hugo, and Eberhard Zwicker. *Psychoacoustics: Facts and Models*. 3rd. ed. Springer Series in Information Sciences 22. Berlin; New York: Springer, 2007.

Blauert, Jens. *Spatial Hearing: The Psychophysics of Human Sound Localization*. Rev. ed. Cambridge, Mass: MIT Press, 1997.

Kahrs, Mark, and Karlheinz Brandenburg, eds. *Applications of Digital Signal Processing to Audio and Acoustics*. The Kluwer International Series in Engineering and Computer Science, SECS 437. Boston: Kluwer, 1998.

Roginska, Agnieszka, ed. *Immersive Sound: The Art and Science of Binaural and Multi-Channel Audio*. New York; London: Routledge, 2017.

Online Repository

The presentations of this lecture will be made available to students subscribed to this lecture only.