

Audio Engineering (E022020)

Course size *(nominal values; actual values may depend on programme)*

Credits 4.0

Study time 120 h

Course offerings and teaching methods in academic year 2024-2025

A (semester 2)	English	Gent	practical lecture seminar
----------------	---------	------	---------------------------------

Lecturers in academic year 2024-2025

Botteldooren, Dick	TW05	lecturer-in-charge
Thomas, Pieter	TW05	co-lecturer

Offered in the following programmes in 2024-2025

	crdts	offering
Master of Science in Electrical Engineering (main subject Communication and Information Technology)	4	A
Master of Science in Electrical Engineering (main subject Electronic Circuits and Systems)	4	A

Teaching languages

English

Keywords

Auditory perception, loudspeakers and microphones, room acoustics, recording and playback techniques, audio signal processing

Position of the course

This course involves the study of all aspects of recording, processing and reproduction of sound. On the one hand, state-of-the-art techniques with a strong emphasis on practical applications are taught; on the other hand, the student will acquire the necessary knowledge and skills to be able to participate in the design of future technologies and systems. Attention will be paid to handling of the necessary equipment, but also to the characteristics of human hearing, the influence of the acoustic environment, and the possibilities for using digital signal processing techniques to deceive the ear and to enhance or correct acoustic effects.

Contents

- Perception of sound, including binaural hearing
- Electromagnetical description of loudspeakers and microphones, equivalent circuits, amplifiers
- Common microphone and loudspeaker technologies, including MEMS and parametric arrays
- Directivity (cardioid, hypercardioid, ...), loudspeaker and microphone arrays, including algorithms for beam forming in planar and spherical arrays
- Concepts of room acoustics, recording studios, insulation, measurement
- Recording and reproduction techniques
- 3D reproduction systems (stereo, surround, Dolby, wave field synthesis, ...) and binaural reproduction (HRTF)
- Digital signal processing for audio applications: active noise control, echo-cancelling, effects
- Audio in virtual reality

Initial competences

Basic knowledge of math, physics and electronics

Final competences

- 1 Insight in auditory perception
- 2 Designing loudspeaker and microphone systems
- 3 Application of recording and reproduction techniques
- 4 Calculating the influence of rooms on auditory perception
- 5 Designing novel audio systems

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Seminar, Lecture, Practical

Extra information on the teaching methods

- Lectures: theoretical
- Practicum: loudspeaker design, room acoustics...

Study material

Type: Slides

Name: Annotated slides

Indicative price: Free or paid by faculty

Optional: no

Language : English

Oldest Usable Edition : two academic years backward

Available on Ufora : Yes

Online Available : Yes

Available in the Library : No

Available through Student Association : No

Additional information: optional: book "Acoustics and Audio Technology" (Mendel Kleiner) and "Electroacoustics" (Mendel Kleiner)

References

See course material

Course content-related study coaching

- The teachers are available during the complete semester for further explanation
- Use of the electronic learning environment

Assessment moments

end-of-term and continuous assessment

Examination methods in case of periodic assessment during the first examination period

Oral assessment, Written assessment

Examination methods in case of periodic assessment during the second examination period

Oral assessment, Written assessment

Examination methods in case of permanent assessment

Assignment

Possibilities of retake in case of permanent assessment

not applicable

Extra information on the examination methods

- Theory: periodic evaluation, aimed at understanding and being able to apply the course material, with special attention to practical problems. Oral (open book) examination without written preparation.
- Exercises: periodic evaluation, aimed at being able to apply computational models. Written calculation exercises integrated in the examination (open book).

Calculation of the examination mark

- Oral examination theory: 50%
- Written examination exercises: 30%
- Practica: 20%

