Module Code	**EEP55C35**
Module Name	Advanced Audio Technologies
ECTS Weighting[1]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	Assistant Professor Nils Peters
Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline	On successful completion of this module, students should be able to: LO1. Describe and explain the fundamental concepts behind essential audio technologies LO2. Design and implement traditional DSP-based audio processing algorithms LO3. Design, Implement and train advanced DL-based audio processing algorithms LO4. Predict, measure, and optimize the complexity of various algorithms LO5. Evaluate and compare the algorithm performance **Graduate Attributes: levels of attainment** To act responsibly - Enhanced To think independently - Enhanced To develop continuously - Enhanced To communicate effectively - Enhanced
Module Content	This module offers an advanced exploration of modern audio technologies. The curriculum delves into the algorithmic design of various core audio technologies that are part of everyday life, such as 3D soundfield analysis, virtual acoustics, perceptual audio coding, noise reduction and dereverberation, blind source separation, or audio quality predictors. Using applied examples, students will advance their understanding of traditional digital signal processing algorithms (e.g., for resource-constrained environments) as well as advanced state-of-the-art deep learning methods. The course is structured around hands-on projects that allow students to apply theoretical knowledge in practical settings. The knowledge gained in this module is relevant in industries such as consumer electronics, automotive, broadcasting, or telecommunications.
Teaching and Learning Methods	This module is a mixture of lectures, problem-solving tutorials and Python-based programming exercises. For real-world experiences, these assignments will involve applying and comparing methods discussed in the lectures using actual audio data.

Assessment Details
Please include the following:

Assessment Component	Assessment Description	LO Addressed	% of total	Week due

- **Assessment Component**
- **Assessment description**
- **Learning Outcome(s) addressed**
- **% of total**
- **Assessment due date**

CA 1	Submission of Course Assignments	L01-L05	15%	5
CA 2	Submission of Course Assignments	L01-L05	15%	8
CA 3	Submission of Course Assignments	L01-L05	15%	11
Exam	Written exam, 2 h	L01-L05	55%	Exam week
Attendance	Students may be deemed non-satisfactory and penalized on their final mark or not eligible to sit the exam if they attend less than 80% of lectures (except in exceptional circumstances, e.g. valid medical cert).			

Reassessment Requirements

Reassessment will consist of a 2hr written examination worth 100% of the mark.

Contact Hours and Indicative Student Workload

Contact hours: 3 hours/ week = 33 hours
Independent Study (preparation for course and review of materials): 2 hours per week in Semester = 22 hours
Independent Study (preparation for assessment, incl. completion of assessment): 2 hours per week over entire Semester = 22 hours.

Recommended Reading List

1. Pulkki and Karjalainen: *Communication Acoustics* (in TCD library)
2. Vorländer: *Auralization, 2nd Edition,* (Available on Library reading room PCs)
3. Schuller: *Intelligent Audio Analysis* (available via Springer Link)
4. Vincent, Virtanen, and Gannot: *Audio Source Separation and Speech Enhancement* (Available on Library reading room PCs)

Module Pre-requisite

- **5C05 - Digital Signal Processing** (or equivalent i.e., knowledge of LTI systems, DFT, types and design of digital filters)
- **5C16 - Deep Learning and its Applications** (or equivalent, i.e., knowledge of Deep Learning concepts (architectures, loss function, backpropagation), use of Python3 for Deep Learning)

Module Co-requisite

Module Website

Blackboard

Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	
Module Approval Date	
Approved by	Prof. Naomi Harte
Academic Start Year	September 2025
Academic Year of Date	2025/2026