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| <b>Module Code</b>                                                                                                 | EEPMMT35                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Module Name</b>                                                                                                 | Acoustics & Auditory Perception                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>ECTS Weighting<sup>1</sup></b>                                                                                  | 5 ECTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Semester taught</b>                                                                                             | Semester 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Module Coordinator/s</b>                                                                                        | Assistant Professor Nils Peters                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Module Learning Outcomes with reference to the Graduate Attributes and how they are developed in discipline</b> | <p>On successful completion of this module, students should be able to:</p> <p>LO1. Explain the relationship between physical properties of sound and the human perception.</p> <p>LO2. Describe and differentiate between fundamental acoustic properties, units, and scales such as frequency, sound pressure, intensity, decibel.</p> <p>LO3. Describe and differentiate between fundamental perceptual attributes such as loudness, pitch, timbre, and spatial hearing.</p> <p>LO4. Analyze audio signals by applying auditory models</p> <p>LO5. Create independent research in Acoustics and Auditory Perception</p> <p>LO6. Produce a research paper incl. literature review or an engineering project on a topic related to Acoustics and Auditory Perception.</p> <p>LO7. Evaluate and contrast different approaches to the experimental evaluation of auditory perception.</p> <p><b>Graduate Attributes: levels of attainment</b></p> <p>To act responsibly - Enhanced</p> <p>To think independently - Enhanced</p> <p>To develop continuously - Enhanced</p> <p>To communicate effectively - Enhanced</p> |
| <b>Module Content</b>                                                                                              | <p>Sound is all around us. But how do humans perceive sound and how can we quantify our impression? How does auditory perception affect application areas such music and film production, building design, digital communication technologies, or even the design of car engines?</p> <p>This module introduces relevant physical and perceptual concepts, attributes, and measures, including: the physics of sound propagation, room acoustics, loudness, pitch perception, timbre perception, auditory masking, Auditory Scene Analysis (ASA), spatial hearing, and sound source localization.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Teaching and Learning Methods</b>                                                                               | <p>Learning is via Lecture presentation and question and answer sessions. Many audio examples will be used to demonstrate the discussed auditory effects. Relationships to different application areas are drawn to make the course content applicable to different fields.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

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| <b>Assessment Details</b><br>Please include the following: <ul style="list-style-type: none"><li>Assessment Component</li><li>Assessment description</li><li>Learning Outcome(s) addressed</li><li>% of total</li><li>Assessment due date</li></ul> | Assessment Component                                                                                                                                                                                                                                                                                                                                                                                                   | Assessment Description                                                                                                                                                                         | LO Addressed | % of total | Week due |
|                                                                                                                                                                                                                                                     | In class exam                                                                                                                                                                                                                                                                                                                                                                                                          | From sound source to neural transduction                                                                                                                                                       | 1, 2         | 15%        | 5        |
|                                                                                                                                                                                                                                                     | In class exam                                                                                                                                                                                                                                                                                                                                                                                                          | The perception of Loudness, Pitch, and Timbre                                                                                                                                                  | 1,2, 3, 4    | 15%        | 8        |
|                                                                                                                                                                                                                                                     | In class exam                                                                                                                                                                                                                                                                                                                                                                                                          | Room acoustics and spatial hearing                                                                                                                                                             | 1, 2, 3, 4   | 15%        | 11       |
|                                                                                                                                                                                                                                                     | Assignment                                                                                                                                                                                                                                                                                                                                                                                                             | Research Essay + Presentation<br>OR<br>Research Project + Presentation                                                                                                                         | 1-7          | 55%        | 14       |
|                                                                                                                                                                                                                                                     | 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 for in case of valid medical note). |              |            |          |
| <b>Reassessment Requirements</b>                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                |              |            |          |
| <b>Contact Hours and Indicative Student Workload</b>                                                                                                                                                                                                | <b>Contact hours:</b> 2 hours per week in Semester = 22 hours                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                |              |            |          |
|                                                                                                                                                                                                                                                     | <b>Independent Study (preparation for course and review of materials):</b> 2 hours per week in Semester = 22 hours                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                |              |            |          |
|                                                                                                                                                                                                                                                     | <b>Independent Study (preparation for assessment, incl. completion of assessment):</b> 30 hours                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                |              |            |          |
| <b>Recommended Reading List</b>                                                                                                                                                                                                                     | <ol style="list-style-type: none"><li>Everest: <i>The Master Handbook of Acoustics</i></li><li>Moore: <i>An Introduction to the Psychology of Hearing</i></li><li>Pulkki and Karjalainen: <i>Communication Acoustics</i></li><li>Howard and Angus: <i>Acoustics and Psychoacoustics</i></li><li>Bregman: <i>Auditory Scene Analysis</i></li><li>Blessner and Salter: <i>Spaces Speak, Are you Listening?</i></li></ol> |                                                                                                                                                                                                |              |            |          |
| <b>Module Pre-requisite</b>                                                                                                                                                                                                                         | None                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                |              |            |          |
| <b>Module Co-requisite</b>                                                                                                                                                                                                                          | None                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                |              |            |          |
| <b>Module Website</b>                                                                                                                                                                                                                               | Blackboard                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                |              |            |          |
| <b>Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.</b>                                                                                                                                       | No                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                |              |            |          |
| <b>Module Approval Date</b>                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                |              |            |          |
| <b>Approved by</b>                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                |              |            |          |
| <b>Academic Start Year</b>                                                                                                                                                                                                                          | 2025                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                |              |            |          |
| <b>Academic Year of Date</b>                                                                                                                                                                                                                        | 2025-26                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                |              |            |          |