Module Code	EEMT17
Module Name	SPATIAL AUDIO
ECTS Weighting[2]	5 ECTS
Semester taught	Semester 2
Module Coordinator/s	DR ENDA BATES
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. Compose, produce and design original spatial content for fixed and interactive media, live performance, and interactive installations LO2. Produce and engineer spatial recordings using binaural and surround microphone techniques, and setup and configure spatial audio software and hardware LO3. Characterise the strengths and weaknesses of different spatialization methods, and understand the pyschoacoustic principles underlying different approaches to spatial audio LO4. Analyse, describe and identify techniques and methods used by spati music composers, sound designers, and acousticians. **Graduate Attributes: levels of attainment** To act responsibly - Attained To think independently - Attained To develop continuously - Attained To communicate effectively - Attained
Module Content	Spatial Audio is a one-semester module which is intended for those interested in using spatial audio techniques in a variety of different contexts, including but not limited to; spatial music composition, cinema surround sound, VR and 360 Video, multimedia performance and interactive installations, audio production and recording, surround sound for gaming and mobile devices, sonification, auditory interfaces, and psychoacoustics. This course is intended to enable future audio engineers, composers, researchers and sound-designers to clearly determine the optimal spatialization schemes and techniques for a given application and environment, as well as motivating further innovation and artistic creativity in the field. Students are presented with a wide variety of spatial content, both in class and also in additional listening

[1] An Introduction to Module Design from AISHE provides a great deal of information on designing and re-designing modules.
[2] TEP Glossary

	sessions/concerts of contemporary and historical works of spatial electroacoustic music. The history of spatial audio is discussed, in terms of mainstream cinema an film, popular music releases,360 Video, and a wide variety of contemporary/ electroacoustic music and composers. Students are encouraged to critically asses the strengths and weaknesses of different techniques to enable their effective an creative use of spatial audio in different contexts. The aim of this module is to give the student a complete understanding of all relevant aspects of current spatial audio technology. It addresses the psychoacoustic principles underlying different techniques, as well as practical production techniques for 5.1 and 7.1 surround sound using the DAW Reaper, Ambisonics, Dolby Digital Encoding, Binaural processing, and a variety spatial microphone techniques. By the end of the course, the student will have a deep understanding of the issues and creative possibilities of spatial audio and a thorough knowledge of all relevant spatial audio systems and topics. This knowledge will enable students to effectively use spatial audio in their subsequer artistic work, and/or facilitate further technical research in this area.
Teaching and Learning Methods	The teaching strategy is a combination of lectures, software and hardware tutorials, dedicated listening sessions, and critique classes on assignment work. Tutorials in Reaper and spatial audio plugins are held in the first hal of the semester, while practical demonstrations of recording techniques, microphone configurations and array calibration are presented later in the semester. Dedicated listening sessions/concerts of classic and contemporary works of spatial music are presented throughout the module. In addition, conventional lecture presentations include many demonstrations of other material, in particular surround sound for film an popular music releases in 5.1and 7.1 Surround Sound. The initial assignment focuses on binaural audio processing and the capture of spati impulse responses. The second, larger assignment consists of a number of options, a surround recording of a music ensemble, band, orchestra or choir, a studio-based spatial music composition, or an acoustical analysis o captured spatial room impulse responses. These options reflect the wide variety of potential applications of spatial audio, and the potentially quite different interests of students taking this module.

Assessment Details[3]

Please include the following:

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

Assessment Component	Assessment Description	LO Addressed	% of total	We due
Assignment 1	Binaural Plugin Comparison Tests (MMT Students) Object: Compare the perceptual performance of two different binaural plugins Binaural Room Impulse Response (BRIR) Survey (MAI/MSC students) Object: Create and Analysis a number of Binaural Room Impulse Responses using ReaVerb	1,2,3	25%	We 6
In class exam	MCQ exam via Blackboard on various topics covered in the module classes to date.	3, 4	10%	We 8
Assignment 3	Option A: 5.1 Location Music Recording (MMT Students) Object: Produce a location music recording for 5.1 using various multichannel microphone techniques. Option B: Spatial Music Composition (MMT Students) Object: Compose an original work of spatial music for 7.1 using Higher Order Ambisonics, B-format recordings, Stereophony and Parameter Modulation in Reaper. Option C: Acoustics Survey and FOA IR capture (MAI Students) Object: Perform an on location acoustic survey	1,2,3,4	65%	We 13

[3] TEP Guidelines on Workload and Assessment

		using monophonic and first order Ambisonic (FOA) microphones, and prepare FOA spatial IRs and example binaural audio files.			

Reassessment Requirements	Resubmission of assignment work
Contact Hours and Indicative Student Workload[3]	**Contact hours: 22+6** 11X2 hour lectures, 6x1 optional tutorials **Independent Study (preparation for course and review of materials): 60 hours** **Independent Study (preparation for assessment, incl. completion of assessment): 14**
Recommended Reading List	Jens Blauert: Spatial Hearing: The Psychophysics of Human Sound Localization Agnieszka Roginska (Editor), & Paul Geluso: Immersive Sound (Audio Engineering Society Presents) 1st Edition Francis Rumsey: Spatial Audio Denis Smalley: Spectromorphology: explaining sound-shapes - (Organised Sound / Volume 2 / Issue 02 / August 1997, pp 107-126); John M. Chowning: The Simulation of Moving Sound Sources - (Computer Music Journal, Vol. 1, No. 3. (Jun., 1977), pp. 48-52); Enda Bates: The Composition and Performance of Spatial Music Website: http://endabates.net/academic.html
Module Pre-requisite	Students will need some prior knowledge of the fundamentals of DAW-based audio production, such as that presented in the Electroacoustic Composition 1 module in the first semester of the MMT programme, for example.
Module Co-requisite	N/A
Module Website	Blackboard
Are other Schools/Departments involved in the delivery of this module? If yes, please provide details.	No

Module Approval Date
Approved by
Academic Start Year
Academic Year of Date