Module Code	Pre-requisite Module codes	Co-Requisite Modules code(s)	ISCED Code	Subject Code	ECTS Credits	NFQ Level (CPD)#
CMPU4018					5	8
Module Title	Speech and Audio Processing					

Speech and Audio Processing

School Responsible:	School of Computing

Module Overview:

The area of speech and audio processing has evolved rapidly with ubiquitous mobile telephony and Voice over IP services such as Skype, Google Hangouts or Apple FaceTime. Audio streaming services like Spotify or YouTube use encodes audio steams to optimize the tradeoff between quality and bandwidth resources. Faster networks, better connectivity, increased processing power combined with advances in signal processing and analysis techniques have made speech controlled applications like Siri possible using server side speech processing. This module provides an introduction to speech and hearing and how digital representations of speech and audio can be processed using high level programming languages (such as Python, Octave or MATLAB). Processing and Analysis techniques and their application to a selection of introductory speech and audio problems will be explored.

This module targets level 8 students with strong programming skills using third party libraries and APIs along with an interest in applying them to digital signal processing applications. Prior digital signal processing experience is not a prerequisite.

Learning Outcomes (LO): (to be numbered)

For a 5ECTS module a range of 4-10 LOs is recommended

On Completion of this module, the learner will be able to

1	Analyse speech and audio signals and features
2	Articulate the characteristics of speech, speech production and speech understanding
3	Describe the signal characteristics of speech and audio signals using appropriate terminology
4	Apply signal processing algorithms to speech and audio signals
5	Create programmes to conduct experiments on speech and audio samples building on third party software libraries

Indicative Syllabus:

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The content of the module will include:

- Introduction to speech and audio processing
- Basic audio processing
- Speech
- The human auditory system
- Psychoacoustics
- Speech communications
- Audio analysis
- Advanced topics (Indicative and will vary)
    - psychoacoustic modelling
    - Speech and Audio Quality
    - Objective models of intelligibility and quality
    - Speaker recognition

Learning and Teaching Methods:	
The course delivery involves a combination of lectures and labs which may incorporate the use of blended learning techniques as appropriate throughout the delivery.	
Total Teaching Contact Hours	39
Total Self-Directed Learning Hours	61

Module Delivery Duration:
One Semester

Assessment		
Assessment Type	**Weighting (%)**	**LO Assessment (No.)**
Examination	60	1-4
Assignments	40	1,4,5
Module Specific Assessment Arrangements (if applicable)		
(a) Derogations from General Assessment Regulations		
(b) Module Assessment Thresholds		

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(c) Special Repeat Assessment Arrangements	

Essential Reading: (author, date, title, publisher)

Ian McLaughlin (2009), *Applied Speech and Audio processing*, 1st edition, Cambridge University Press

Ian Vince McLoughlin (2016), *Speech and Audio Processing: A MATLAB-based Approach*, 1st edition, Cambridge University Press

Supplemental Reading: (author, date, title, publisher)

Ben Gold, Nelson Morgan, Dan Ellis, (2011), *Speech and Audio Signal Processing: Processing and Perception of Speech and Music*, 2nd edition, Wiley

Lawrence Rabiner, B H Juang (1993), *Fundamentals of Speech Recognition*, 1st edition, Pearson

Lawrence Rabiner, Ronald Schafer (2010), *Theory and Applications of Digital Speech Processing*, Pearson

Ken Pohlmann (2010), *Principles of Digital Audio*, 6th Edition, McGraw-Hill

Version No:		**Amended By**	
Commencement Date		**Associated Programme Codes**	

Modules that are to be offered as Stand-Alone CPD Programmes must have an NFQ level assigned

*Details of the assessment schedule should be contained in the student handbook for the programme stage.

Date of Academic Council approval ……

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