

Module code: MOD008404**Version: 2 Date Amended: 22/Jan/2025****1. Module Title**

Synthesis and Sound Design

2a. Module Leader

Richard Edwards

2b. School

Cambridge School of the Creative Industries

2c. Faculty

Faculty of Arts, Humanities, Education and Social Sciences

3a. Level

5

3b. Module Type

Standard (fine graded)

4a. Credits

30

4b. Study Hours

300

5. Restrictions			
Type	Module Code	Module Name	Condition
Pre-requisites:	None		
Co-requisites:	None		
Exclusions:	None		
Courses to which this module is restricted:	BA (Hons) Electronic Music Production, BSc (Hons) Audio and Music Technology, BA (Hons) Music Production, BSc (Hons) Audio and Music Technology		

LEARNING, TEACHING AND ASSESSMENT INFORMATION

6a. Module Description
On this module you'll gain an understanding and working knowledge of electronic music generation, processing and manipulation. Some familiarity with synthesisers or music studios is assumed. We'll explore the architectures of early analogue synthesisers, principally examining the implementation of subtractive synthesis and techniques for sound processing. You'll look at wavetable synthesis (sampling), giving consideration to interpolation schemes and the avoidance of aliasing, and consider practical schemes for multi-sampling of acoustic instruments. You'll also examine Fourier synthesis (additive sine-wave synthesis), with details of practical implementation amplitude modulation including the resultant spectra, which are derived both experimentally and analytically. You'll also examine and compare frequency modulation and phase modulation, applying the concept of the transfer function to a discussion of wave shaping and its role in synthesis. We'll follow this with a discussion of algorithms for dynamic processing, including compression, expansion and companding. By considering the design of filters and echo-based effects, you'll explore the principle of convolution. Finally, you'll examine several other synthesis algorithms, including physical modelling and granular synthesis in the practical context of electronic sound design and performance.
6b. Outline Content
· Modular analogue synthesisers · Sampling theorem, quantisation error · Wavetable synthesis, interpolation · Additive sine-wave synthesis · Subtractive synthesis, envelopes · Convolution, filters and echo · Amplitude modulation, frequency modulation, phase modulation · Waveshaping, transfer functions, nonlinearity, saturation, hysteresis · Dynamic processing · Physical modelling, granular synthesis · Software environments for creative coding and live coding

6c. Key Texts/Literature

The reading list to support this module is available at: <https://readinglists.aru.ac.uk/>

6d. Specialist Learning Resources

Music studios with suitable hardware and software.

7. Learning Outcomes (threshold standards)

No.	Type	On successful completion of this module the student will be expected to be able to:
1	Knowledge and Understanding	Understand a range of synthesis algorithms used in commercial synthesisers.
2	Knowledge and Understanding	Understand the applicability of these algorithms to the generation of sound.
3	Intellectual, practical, affective and transferrable skills	Design a range of timbres for use in musical composition.

8a. Module Occurrence to which this MDF Refers

Year	Occurrence	Period	Location	Mode of Delivery
2026/7	ZZF	Template For Face To Face Learning Delivery		Face to Face

8b. Learning Activities for the above Module Occurrence

Learning Activities	Hours	Learning Outcomes	Details of Duration, frequency and other comments
Lectures	48	1-3	2-hour lecture/demonstration every week
Other teacher managed learning	0	N/A	N/A
Student managed learning	252	1-3	Experiments, coursework and revision
TOTAL:	300		

9. Assessment for the above Module Occurrence

The assessment for some modules includes a presentation (see below for details on how this particular module is assessed). We recognise that presenting, especially to a large group, can cause significant anxiety or distress for some students. If this may affect you, please contact your Module Leader or the Disability and Neurodiversity Service as early as possible. We will work with you to consider appropriate reasonable adjustments. Depending on your individual needs, these might include, for example, presenting to a smaller group or presenting only to a member of academic staff.

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
010	Practical	1-3	30 (%)	Fine Grade	30 (%)

Presentation on synthesiser (15 minutes, 2000-word equivalent).

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
011	Coursework	1-3	40 (%)	Fine Grade	30 (%)

Synth-based composition and/or performance (15 minutes, 2000-word equivalent).

Assessment No.	Assessment Method	Learning Outcomes	Weighting (%)	Fine Grade or Pass/Fail	Qualifying Mark (%)
012	Practical	1-3	30 (%)	Fine Grade	30 (%)

Practical Exercise (15 min, 2000-word equivalent) Students to be given two options: Design a library of synth presets that explores the full potential of a chosen commercial software/hardware synthesiser and create a piece of music to showcase the sounds Develop a bespoke synthesiser using an audio-coding environment like Max/MSP, based on established synthesis methods, e.g., AM, FM, granular, additive, subtractive.

In order to pass this module, students are required to achieve an overall mark of 40% (for modules at levels 3, 4, 5 and 6) or 50% (for modules at level 7*).

In addition, students are required to:

- (a) achieve the qualifying mark for each element of fine graded assessment as specified above
- (b) pass any pass/fail elements

[* the pass mark of 50% applies for all module occurrences from the academic year 2024/25 – see Section 3a of this MDF to check the level of the module and Section 8a of this MDF to check the academic year]