



<b>Title:</b>	Mathematics and Music <b>APPROVED</b>
<b>Long Title:</b>	Mathematics and Music
<b>Module Code:</b>	MATH6050
<b>Credits:</b>	5
<b>NFQ Level:</b>	Fundamental
<b>Field of Study:</b>	Mathematics
<b>Valid From:</b>	Semester 2 - 2013/14 ( February 2014 )
<b>Module Delivered in</b>	no programmes
<b>Module Coordinator:</b>	David Goulding
<b>Module Author:</b>	
<b>Module Description:</b>	This module is an exploration of some of the many links between Mathematics and Music. The learner should contact the module coordinator to ensure they have the appropriate level of mathematics and music knowledge prior to registering for this module. Maximum class size of 20, arising from the interactive nature of this module and the substantial practical content.
<b>Learning Outcomes</b>	
<i>On successful completion of this module the learner will be able to:</i>	
LO1	Describe and analyse horizontal and vertical structures in music.
LO2	Describe and manipulate mathematical waveforms and their relationship to musical sound.
LO3	Describe the relationship between analogue sounds and their digital counterparts, and carry out calculations related to their conversion.
LO4	Describe and calculate various tuning methodologies.
LO5	Develop simple melodies using algorithmic methods.
<b>Pre-requisite learning</b>	
<b>Module Recommendations</b> <i>This is prior learning (or a practical skill) that is strongly recommended before enrolment in this module. You may enrol in this module if you have not acquired the recommended learning but you will have considerable difficulty in passing (i.e. achieving the learning outcomes of) the module. While the prior learning is expressed as named CIT module(s) it also allows for learning (in another module or modules) which is equivalent to the learning specified in the named module(s).</i>	
No recommendations listed	
<b>Incompatible Modules</b> <i>These are modules which have learning outcomes that are too similar to the learning outcomes of this module. You may not earn additional credit for the same learning and therefore you may not enrol in this module if you have successfully completed any modules in the incompatible list.</i>	
No incompatible modules listed	
<b>Co-requisite Modules</b>	
No Co-requisite modules listed	
<b>Requirements</b> <i>This is prior learning (or a practical skill) that is mandatory before enrolment in this module is allowed. You may not enrol on this module if you have not acquired the learning specified in this section.</i>	
No requirements listed	
<b>Co-requisites</b>	
No Co Requisites listed	

**Module Content & Assessment**

**Indicative Content**

**Horizontal and vertical structures**

Time signature, tempo, pitch, modular arithmetic. Circle of fifths, row charts.

**Waveforms**

Periodic functions, amplitude, frequency, phase. Harmonics, elementary treatment of Fourier Series, from sine waves to square, triangular and sawtooth waves.

**The digital domain**

Indices, binary, decimal and hexadecimal conversion, A-D and D-A, bit depth, sampling frequency, dither.

**Tuning**

The power of 2. Musical intervals and scales. Ratios and logarithms. Just temperament and equal temperament. Application to instrument design.

**Algorithmic composition**

History, random composition, Guido's method, algorithmic methods. Elementary treatment of fractal music. Practical content: Wolfram Tones.

**Assessment Breakdown**

	%
Course Work	100.00%

**Course Work**

Assessment Type	Assessment Description	Outcome addressed	% of total	Assessment Date
Short Answer Questions	In class: Short answer questions on horizontal and vertical structures.	1	20.0	Week 3
Short Answer Questions	In class: Short answer questions on periodic functions	2	20.0	Week 6
Multiple Choice Questions	Online multiple choice test on digital arithmetic.	3	20.0	Week 8
Multiple Choice Questions	Online multiple choice test on intervals and scales.	4	20.0	Week 11
Project	Submit a short piece of music composed using algorithmic methods	5	20.0	Sem End

No End of Module Formal Examination

**Reassessment Requirement**

**Repeat examination**

*Reassessment of this module will consist of a repeat examination. It is possible that there will also be a requirement to be reassessed in a coursework element.*

**The institute reserves the right to alter the nature and timings of assessment**

**Module Workload**

<b>Workload: Full Time</b>				
<i>Workload Type</i>	<i>Workload Description</i>	<i>Hours</i>	<i>Frequency</i>	<i>Average Weekly Learner Workload</i>
Lecture	Classroom interactions	2.0	Every Week	2.00
Lab	Weekly lab using software relevant to course	1.0	Every Week	1.00
Tutorial	Weekly worksheet sessions	1.0	Every Week	1.00
Independent Learning	Self directed work, including elements of group learning	3.0	Every Week	3.00
Total Hours				7.00
Total Weekly Learner Workload				7.00
Total Weekly Contact Hours				4.00

**This module has no Part Time workload.**

## Module Resources

### Supplementary Book Resources

- David Wright 2009, *Mathematics and music*, American Mathematical Society Providence, R.I. [ISBN: 9780821848739]
- Gareth Loy, *Musimathics (Volume 1)* [ISBN: 9780262122825]
- James S Walker, Gary W Don 2013, *Mathematics and Music: Composition, Perception and Performance*, CRC Press [ISBN: 9781439867105]

*This module does not have any article/paper resources*

### Other Resources

- Website: *Blackboard*  
<http://citbb.blackboard.com>
- Website: *Music Theory*  
<http://www.musictheory.net/>
- Website: *Wolfram Tones*  
<http://tones.wolfram.com/>
- Website: *Fractal Adventures*  
<http://www.fractaladventures.com/>

