

Professor Guerino Mazzola

Fall 2017. MUS 5591, Ferg 81: *Introduction to Music Information Technology*

### **Course Description**

*Introduction to Music Information Technology* is a first introduction to some basic concepts, theories, and hard- and software technologies regarding music. We first discuss the nature of sound and its most famous synthesis methods: Fourier, Frequency Modulation, Wavelets, and Physical Modeling. We then discuss the digital encoding and decoding of sound and related file formats with their compression, and in more detail MP3. After this sound-oriented discourse, we look at symbolic encoding, mainly MIDI and associated soft- and hardware. We then have a more systematic look at a number of audio and MIDI software, including Audacity, GarageBand, Live, Logic, Sibelius/Finale, and Max. However, this is not a course on one of these software, we shall just try to work with them in order to see how they implement audio and MIDI encoding of sound. We terminate the course by a short discussion of the technology of global music.

### **Media and Collaboration**

Powerpoint slides, audio and MIDI software, blackboard discussions (important!). Collaboration with students essential.

### **Prerequisites**

Instructor's consent, but most importantly the willingness to understand how sound and symbolic music data are encoded and implemented in various software environments.

### **Goals and Objectives**

The three principal objectives: (1) to understand how sound and notes are structured, (2) how these structures are encoded in analog and digital concept frameworks, and (3) how these concept frameworks are implemented in various commercial software environments.

The goal of this course is also to work together to understand creativity in music technology, this was also a topic of my course on musical creativity in Spring 2012, and it is described in detail in my book **Musical Creativity—Strategies and Tools in Composition and Improvisation**, by Springer (in the book series *Computational Music Science*).

### **Grading**

I grade on a scale 0-10 with 0.1 steps: 9.5-10 = A, 9-9.4 = A-, 8.5-8.9 = B+, 7.6-8.4 = B, 7-7.5 = B-, 6.5-6.9 = C; 6-6.4 = C-, 5-5.9 = D, 0-4.9 = F.

We make a Finite Fourier theory test and

we have three presentations, each given (ideally) by a group of two students.

1st in-class presentation due October 04/06/09, length = 20 minutes.

2nd in-class presentation due November 01/03/06, length = 20 minutes.

3rd in-class presentation due December 01/04/06/08, length = 40 minutes.

Final grade: Class participation 30%, Fourier test 10%, first presentation 15%, second presentation 15%; third presentation 30%; no final exam.

Plagiarism will not be tolerated and will lead to failure.

### **Contact**

My office hours are by appointment (room 164).

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Web = <http://www.encyclospace.org>

## Schedule of Classes

### *I Introduction and ontology*

I.1 (W Sep 06)	Introduction	Introduction and overview
I.2 (Fr Sep 08)	Introduction	The ontology of music
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I.3 (M Sep 11)	Introduction	Discussion of ontology by examples

### *II Acoustic Reality*

II.1 (W Sep 13)	Acoustic Reality	Sound
II.2 (Fr Sep 15)	Acoustic Reality	The communicative dimension of sound
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II.3 (M Sep 18)	Acoustic Reality	Fourier
II.4 (W Sep 20)	Acoustic Reality	FM, Wavelets, Physical Modeling
II.5 (Fr Sep 22)	Acoustic Reality	Examples via Audacity SW
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II.6 (M Sep 25)	Acoustic Reality	Examples: Simple waves
II.7 (W Sep 27)	Acoustic Reality	Examples: Noise, envelopes
II.8 (Fr Sep 29)	Acoustic Reality	Examples: Own recordings
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II.9 (M Oct 02)	Acoustic Reality	Examples: Spectra, Tuning, FM
II.10 (W Oct 04)	Acoustic Reality	Assigned presentations 1
II.11 (Fr Oct 06)	Acoustic Reality	Assigned presentations 1
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II.12 (M Oct 09)	Acoustic Reality	Assigned presentations 1

### *III Electromagnetic encoding of music: Audio HW and SW*

III.1 (W Oct 11)	Audio HW and SW	General picture of analog/digital sound encoding
III.2 (Fr Oct 13)	Audio HW and SW	LP and tape technologies, some history
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III.3 (M Oct 16)	Audio HW and SW	The digital approach, sampling
III.4 (W Oct 18)	Audio HW and SW	Finite Fourier analysis
III.5 (Fr Oct 20)	Audio HW and SW	FFT
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III.6 (M Oct 23)	Audio HW and SW	MP3, MP4, AIFF
III.7 (W Oct 25)	Audio HW and SW	Examples of compression
III.8 (Fr Oct 27)	Audio HW and SW	Filters, EQ, Reverb
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III.9 (M Oct 30)	Audio HW and SW	Time and pitch stretching
III.10 (W Nov 01)	Audio HW and SW	Assigned presentations 2
III.11 (Fr Nov 03)	Audio HW and SW	Assigned presentations 2
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III.12 (M Nov 06)	Audio HW and SW	Assigned presentations 2

### *IV Symbolic Formats: Notes, MIDI, Denotators*

IV.1 (W Nov 08)	Symbolic Formats	Western notation and performance
IV.2 (Fr Nov 10)	Symbolic Formats	MIDI: what it is about, short history

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IV.3 (M Nov 13)	Symbolic Formats	MIDI networks: MIDI devices, ports, and cables
IV.4 (W Nov 15)	Symbolic Formats	MIDI messages: hierarchy and anatomy
IV.5 (Fr Nov 17)	Symbolic Formats	Time in MIDI, MIDI Standard files
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IV.6 (M Nov 20)	Symbolic Formats	Short introduction to Denotators
 <i>V SW Environments for MIDI and Audio</i>		
V.1 (W Nov 22)	Symbolic Formats	Short introduction to Denotators and Rubato
Thanksgiving		
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V.2 (M Nov 27)	SW Environments	Rubato
V.3 (W Dec 29)	SW Environments	Rubato/BigBang Rubette
V.4 (F Dec 01)	SW Environments	Assigned presentation 3 Steinway Player Piano
Thanksgiving		
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V.5 (M Dec 04)	SW Environments	Assigned presentation 3 Reason
V.6 (W Dec 06)	SW Environments	Assigned presentation 3 MaxMSP
V.7 (Fr Dec 08)	SW Environments	Assigned presentation 3 Rubato Composer
 <i>VI Global Music</i>		
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VI.1 (M Dec 11)	Global Music	Summary of course
VI.2 (W Dec 13)	Global Music	Concluding observations and discussion

### **Selected Original References**

Audacity software: <http://audacity.sourceforge.net>

Dan Hosken: Introduction to Music Technology. Routledge, New York and London 2nd ed. 2015

Curtis Roads: The Computer Music Tutorial. MIT Press Cambridge Mass. and London 1998

Curtis Roads: Composing Electronic Music. Oxford U Press, New York City 2015

Guerino Mazzola: The Topos of Music. Birkhaeuser, Basel 2002

Guerino Mazzola et al: Elemente der Musikinformatik. Birkhaeuser, Basel 2006

Guerino Mazzola et al: Musical Creativity. Springer, Heidelberg 2011

*Guerino Mazzola et al: Basic Music Technology. Springer, Heidelberg 2017*

Guerino Mazzola et al: <http://www.rubato.org>

Powerpoints and other materials are on my homepage: <http://www.encyclospace.org>