

Professor Guerino Mazzola

Fall 2022. 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 03/05/08, length = 20 minutes.

2nd in-class presentation due October/November 31/02/05, length = 20 minutes.

3rd in-class presentation due November/December 30/03/05/07, 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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Schedule of Classes

I Introduction and ontology

I.1 (W Sep 07)	Introduction	Introduction and overview
I.2 (F Sep 09)	Introduction	The oninotology of music
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I.3 (M Sep 12)	Introduction	Discussion of oniontology by examples

II Acoustic Reality

II.1 (W Sep 14)	Acoustic Reality	Sound
II.2 (Fr Sep 16)	Acoustic Reality	The communicative dimension of sound
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II.3 (M Sep 19)	Acoustic Reality	Fourier
II.4 (W Sep 21)	Acoustic Reality	FM, Wavelets, Physical Modeling
II.5 (Fr Sep 23)	Acoustic Reality	Examples via Audacity SW
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II.6 (M Sep 26)	Acoustic Reality	Examples: Simple waves
II.7 (W Sep 28)	Acoustic Reality	Examples: Noise, envelopes
II.8 (Fr Sep 30)	Acoustic Reality	Examples: Own recordings
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II.9 (M Oct 03)	Acoustic Reality	Examples: Spectra, Tuning, FM
II.10 (W Oct 05)	Acoustic Reality	Assigned presentations 1
II.11 (Fr Oct 07)	Acoustic Reality	Assigned presentations 1
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II.12 (M Oct 10)	Acoustic Reality	Assigned presentations 1

III Electromagnetic encoding of music: Audio HW and SW

III.1 (W Oct 12)	Audio HW and SW	General picture of analog/digital sound encoding
III.2 (Fr Oct 14)	Audio HW and SW	LP and tape technologies, some history
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III.3 (M Oct 17)	Audio HW and SW	The digital approach, sampling
III.4 (W Oct 19)	Audio HW and SW	Finite Fourier analysis
III.5 (Fr Oct 21)	Audio HW and SW	FFT
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III.6 (M Oct 24)	Audio HW and SW	MP3, MP4, AIFF
III.7 (W Oct 26)	Audio HW and SW	Examples of compression
III.8 (Fr Oct 28)	Audio HW and SW	Filters, EQ, Reverb
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III.9 (M Oct 31)	Audio HW and SW	Time and pitch stretching
III.10 (W Nov 02)	Audio HW and SW	Assigned presentations 2
III.11 (Fr Nov 04)	Audio HW and SW	Assigned presentations 2
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III.12 (M Nov 07)	Audio HW and SW	Assigned presentations 2

IV Symbolic Formats: Notes, MIDI, Denotators

IV.1 (W Nov 09)	Symbolic Formats	Western notation and performance
IV.2 (Fr Nov 11)	Symbolic Formats	MIDI: what it is about, short history

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IV.3 (M Nov 14)	Symbolic Formats	MIDI networks: MIDI devices, ports, and cables
IV.4 (W Nov 16)	Symbolic Formats	MIDI messages: hierarchy and anatomy
IV.5 (Fr Nov 18)	Symbolic Formats	Time in MIDI, MIDI Standard files
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IV.6 (M Nov 21)	Symbolic Formats	Short introduction to Denotators
 <i>V SW Environments for MIDI and Audio</i>		
V.1 (W Nov 23)	Symbolic Formats	Short introduction to Denotators and Rubato
Thanksgiving		
V.2 (M Nov 28)	SW Environments	Rubato
V.3 (W Nov 30)	SW Environments	Rubato/BigBang Rubette
V.4 (F Dec 02)	SW Environments	Assigned presentation 3 Steinway Player Piano
Thanksgiving		
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V.5 (M Dec 05)	SW Environments	Assigned presentation 3 Reason
V.6 (W Dec 07)	SW Environments	Assigned presentation 3 MaxMSP
V.7 (Fr Dec 09)	SW Environments	Assigned presentation 3 Rubato Composer
 <i>VI Global Music</i>		
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VI.1 (M Dec 12)	Global Music	Summary of course
VI.2 (W Dec 14)	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 2018

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>