Professor Guerino Mazzola

Spring 2021: 8590 Readings in Music Theory: *Basic Mathematics for Music Theorists*

(zoom and canvas remote class)

Canvas: https://umn.instructure.com/courses/95310

Course Description
American Set Theory, Lewin's Transformational Theory, Euopean Tradition, and Sound theory/technology require a firm knowledge about sets, functions, graphs, numbers, groups, modules, categories and Fourier theory. This course covers these basics with examples and exercises from music theory.

Media and Collaboration
We work at the blackboard to learn interactively making the calculations. We want to be able to use maths like we play the piano, not as a passive knowledge base. Will be fun, no stress!

Prerequisites
No special prerequisites except to some degree the usual highschool maths, but the most important: interest and confidence that this material is absolutely basic, since professional maths looks different from highschool maths.

Goals and Objectives
This course meets the demand for a formal competence to understand and work in mathematically articulated music theory, such as American Set Theory, Transformational Theory, European Mathematical Music Theory, and Sound theory/technology. The course will cover a basic instruction in sets, numbers, graphs, groups, modules, categories and (finite) Fourier theory. The course content is motivated and complemented by numerous examples and exercises from the litarture of music theory.

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.
Final grade: Class participation 2/3, class papers 1/3, no final exam.
We shall make many exercises together and also small written tests in class at the end of each of the eight topics.
Plagiarism will not be tolerated and will lead to failure.

Contact
My online office hours are by appointment.
Email = mazzola@umn.edu
Web = http://www.encyclospace.org

Schedule of online (zoom and canvas) Classes

W Jan 20 I.1 Sets, Relations, and Functions
F Jan 22 I.2 Sets, Relations, and Functions

M Jan 25 I.3 Sets, Relations, and Functions
W Jan 27 I.4 Sets, Relations, and Functions
F Jan 29 I.5 Sets, Relations, and Functions: TEST 1

M Feb 01 II.1 Natural Numbers $\mathbb{N}$, Recursion
W Feb 03 II.2 Natural Numbers $\mathbb{N}$, Recursion
F Feb 05 II.3 Natural Numbers $\mathbb{N}$, Recursion

M Feb 08 II.3 Natural Numbers $\mathbb{N}$, Recursion: TEST 2

W Feb 10 III.1 Classical Number Domains: Integers $\mathbb{Z}$, Rationals $\mathbb{Q}$, Reals $\mathbb{R}$, Complexes $\mathbb{C}$
F Feb 12 III.2 Classical Number Domains: Integers $\mathbb{Z}$, Rationals $\mathbb{Q}$, Reals $\mathbb{R}$, Complexes $\mathbb{C}$

M Feb 15 III.3 Classical Number Domains: Integers $\mathbb{Z}$, Rationals $\mathbb{Q}$, Reals $\mathbb{R}$, Complexes $\mathbb{C}$
W Feb 17 III.4 Classical Number Domains: Integers $\mathbb{Z}$, Rationals $\mathbb{Q}$, Reals $\mathbb{R}$, Complexes $\mathbb{C}$
F Feb 19 III.5 Classical Number Domains: Integers $\mathbb{Z}$, Rationals $\mathbb{Q}$, Reals $\mathbb{R}$, Complexes $\mathbb{C}$

M Feb 22 III.6 Classical Number Domains: Integers $\mathbb{Z}$, Rationals $\mathbb{Q}$, Reals $\mathbb{R}$, Complexes $\mathbb{C}$: TEST 3

W Feb 24 IV.1 Graphs and Nerves
F Feb 26 IV.2 Graphs and Nerves

M Mar 01 IV.3 Graphs and Nerves
W Mar 03 IV.4 Graphs and Nerves
F Mar 05 IV.5 Graphs and Nerves: TEST 4

M Mar 08 V.1 Algebra and Matrices
W Mar 10 V.2 Algebra and Matrices
F Mar 12 V.3 Algebra and Matrices

M Mar 15 V.4 Algebra and Matrices
W Mar 17 V.5 Algebra and Matrices
F Mar 19 V.6 Algebra and Matrices: TEST 5

M Mar 22 VI.1 Linear Algebra and Geometry
W Mar 24 VI.2 Linear Algebra and Geometry
F Mar 26 VI.3 Linear Algebra and Geometry

M Mar 29 VI.4 Linear Algebra and Geometry
W Mar 31 VI.5 Linear Algebra and Geometry
F Apr 02 VI.6 Linear Algebra and Geometry: TEST 6

Spring Break Apr. 05 – Apr. 09

M Apr 12 VII.1 Categories and Networks
W Apr 14 VII.2 Categories and Networks
F Apr 16 VII.3 Categories and Networks

M Apr 19 VII.4 Categories and Networks
W Apr 21 VII.5 Categories and Networks
F Apr 23 VII.6 Categories and Networks: TEST 7

M Apr 26 VIII.1 Exponential, Logarithm, and Fourier Theory
W Apr 28 VIII.2 Exponential, Logarithm, and Fourier Theory
F May 30 VIII.3 Exponential, Logarithm, and Fourier Theory

M May 03 VIII.4 Exponential, Logarithm, and Fourier Theory: TEST 8

References (just as a background material, not to impress anybody)
(all Springer and Birkhäuser books available at the U of M online library service by Springer)
G. Mazzola: The Topos of Music. Birkhäuser, Basel 2002
G. Mazzola et al.: Comprehensive Mathematics for Computer Scientists, I, II. Springer, Heidelberg et al. 2004.
G. Mazzola et al.: Cool Math for Hot Music. Springer 2016
G. Mazzola et al.: The Topos of Music I, II, III, IV (2nd ed.). Springer, Heidelberg 2018
J. Rahn: Basic Atonal Theory. Longman, New York 1980
D. Lewin: Generalized Musical Intervals and Transformations. Oxford University Press, Oxford 2007