

Mathematics and Music

Math 109/Music 109M

Spring 2004

Instructor: David Wright
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Web page: www.math.wustl.edu/~wright/

Office Hours: MWF 2:00-3:00

Class Meetings: MWF 1:00-2:00 in Life Sciences, Room 118

Computer/Synthesizer Work Stations: Five work stations located in the Natural Sciences Learning Center, Life Sciences Room 117, will be dedicated to the course. Each station has a Macintosh G4 computer connected via a MIDI interface to a Kurzweil K2600 synthesizer. The computer has the musical notation/sequencing program Finale installed. Except for a few exceptional days, the hours for the lab are:

M-Th:	9:00am - midnight
F:	9:00am – 4:00pm
Sat:	1:00pm – 5:00pm
Sun:	noon – midnight

Students should view the NSLC web page at www.nslc.wustl.edu for further information.

Equipment and Supplies: Students will need a scientific calculator with graphing and numerical integration capabilities. The TI-83 is recommended. In addition students may need a floppy disk (PC format) on which to store synthesizer configurations. (Purchase of this item can be delayed until it is needed.)

Text: A set of notes prepared by the instructor will be handed out in class and posted online at www.math.wustl.edu/~wright/.

Prerequisites: We assume familiarity with algebra, trigonometry, functions and graphs at the high school level. We assume familiarity with musical staves, standard clefs, and key signatures.

Content: This course is a study of interrelationships between mathematics and music. It will review some background concepts in music and mathematics as they are encountered. Music concepts covered include diatonic and chromatic scales (standard

and non-standard), intervals, rhythm, meter, form, melody, chords, progressions, equal and meantone temperament, just intonation, overtones, timbre, formants. Mathematical concepts covered include integers, rational and real numbers, equivalence relations, geometric transformations, groups, rings, modular arithmetic, logarithms, periodic functions, and (if time permits) numerical integration.

- Goals:**
1. Understand relationships between mathematics and music.
 2. Develop/enhance the students' musical knowledge and creativity.
 3. Develop/enhance the students' skills in abstract reasoning and computation.
 4. Integrate the students' artistic and analytic skills.
 5. Introduce the computer and synthesizer as interactive tools for musical and mathematical creativity.

Exams: *In Class Exams:* February 20, March 26, April 23 (all are Fridays)
Final Exam: Thursday, May 1, 10:30am-12:30pm

Legitimate excuses for missing an exam (such as verified illness or serious family emergency) must be approved, preferably in advance. In such cases there is no make-up exam. Instead, a grade for the missed exam will be calculated based on the other exam scores.

Homework: Assignments will be given out approximately every two weeks. The due dates of the assignments are: 2/1, 2/16, 3/1, 3/22, 4/5, 4/19 (all are Mondays). Assignments 2 and 4 will involve musical examples to be submitted electronically as mp3 files. Directions for online submission will be provided. Assignments will be collected and returned in a designated drawer in the Life Sciences lounge, Room LS 104. Homeworks will be graded and returned with solutions within a week. No late homework will be accepted.

Project: Each student is required to turn in a project consisting of one or more musical examples/compositions that demonstrate concepts learned in the course. Examples might employ combinations of melodic transformations, polyrhythmic patterns, non-standard scales, micro tuning, modular arithmetic, 12-tone (or n-tone) games, and/or created sounds. Various ideas for projects will be offered in class. The project should include audio examples in the form of one or more mp3 files submitted online with accompanying musical scores and documentation. The project is due on Friday, April 30 (the last day of class). Projects turned in late will receive half credit.

Assistant and Grader:

Alex Basson

Phone: 645-3122

Office hours: Th 2:30-4 in Cupples I Rm 203

F 2-3:30 in LS Rm117

E-mail: alex@math.wustl.edu

Grading: The final grade will be based on the exams, homework, and project as follows: $\frac{3}{8}$ weighting on the exams, $\frac{3}{8}$ weighting on the homework, and $\frac{1}{4}$ weighting on the project.