MATH 129: Math and Music

University of New Mexico, Spring 2016

Instructor: James Degnan

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Office: SMLC (Science and Math Learning Center) 342 (3rd floor)

Office Hours: MW, 9:30-10:30

Prerequisite: MATH 101 and 102

Textbook: Music and Probability, David Temperly (*The MIT Press, 2007*)

Calculator: Calculators are not required. **Calculators** will be allowed on all of the exams (including the final).

Homework: Your homework is your most important effort in this course. It is imperative that you do all of the assigned problems, especially the hard ones, because this is how you actually learn the material.

Quizzes: There will be 12 in-class quizzes (10 points each) given throughout the term. Because your two lowest scores will be dropped, there will be no make-up quizzes given.

Exams: There will be two in-class exams, 100 points each. You have to show all your work. A correct answer without work will receive 0 points. If you **must** miss an exam, you **must** contact your instructor **on** or **before** the day of the exam in order to discuss a make-up test. Make-up tests will be given solely at your instructor's discretion. If you do not contact your instructor immediately, you may be dropped from the course.

Final Exam: The final exam is worth 200 points. A project or report on a topic approved by the instructor can be done instead of a final exam.

Grading: To get full credit on graded work students must address all mathematical components presented by the problem, showing all steps and calculations. The use of proper notation, well structured procedures, and legibility will be taken into account when assigning points.

Your grade will be determined based on your performance on the following:

Assignments	200 pts
Tests and quizzes	320 pts
Cumulative Final	200 pts
Total	720 pts

Withdrawals: Students that withdraw after the end of week 3 but before the end of week 12 will receive a grade of "W". If you do not withdraw, you will receive a letter grade of A, B, C, D, or F (but not a W). See below for all deadlines

Note: Notes of any kind, 3x5 cards, books, cell phones, computers, headphones etc. are **not allowed** on any tests, including the Final Exam.

Communication: Please check your UNM e-mail regularly or make sure to forward your e-mail from that address to an account that you check at least daily. Your instructor may send you important information and updates to your UNM e-mail address. Also, if you e-mail your instructor, please include your full name and the class and section that you are in.

Deadlines: The Department of Mathematics and Statistics will adhere to the registration deadlines published by the Office of the Registrar in the schedule of classes.

Attendance: Attendance is mandatory. If a student has three or more unexcused absences he/she may be dropped from the course. Tardiness or early departure may be regarded as absence. Please note that it is the student's responsibility to drop the course if he/she stops attending. A failing grade may be assigned if the student stops attending and does not drop.
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Student Behavior: According to the Code of Conduct as stated in the Policies and Regulations for UNM, student activities that interfere with the rights of others to pursue their education or to conduct their University duties and responsibilities will lead to disciplinary action. This includes any activities that are disruptive to the class and any acts of academic dishonesty. Students are expected to behave in a courteous and respectful manner toward the instructor and their fellow students. Students may be dropped for inappropriate behavior.

Accommodation Statement *Accessibility Services (Mesa Vista Hall 2021, 277-3506) provides academic support to students who have disabilities. If you think you need alternative accessible formats for undertaking and completing coursework, you should contact this service right away to assure your needs are met in a timely manner. If you need local assistance in contacting Accessibility Services, see the Bachelor and Graduate Programs office.*

Registration, Drop, and Grade Change Deadlines: The Department of Mathematics and Statistics will adhere to ALL registration deadlines published by the Office of the Registrar in the schedule of classes. For full term classes in the spring 2016 term the deadlines are:

January 29th	Add a course or change sections
January 29th	Last day to change grade mode
April 15th	Last day to withdraw **without** the Dean's permission (grade of W assigned)
May 6th	Last day to withdraw **with** the Dean's Permission

Student Learning Outcomes: By the end of the course, students will be able to

A. Manipulate Musical Time

1. Be able to use Algebra techniques to relate lengths of musical compositions to their tempos, and rates of note values to their durations.
2. Understand how fractions relate to musical durations. Be able to multiply and add fractions in the context of musical problems.
3. Determine whether two musical phrases have equivalent durations.

B. Use Combinations and Permutations

1. Create new orchestrations or variations of melodies and rhythms to generate variations in music
2. Use mathematical combinations and permutations to count possibilities without enumerating all of them.
3. Enumerate all permutations and circular permutations for a set of objects (e.g., a melody or rhythm).

C. Interpret Graphs

1. Interpret a graph of a sound wave in terms of amplitude, frequency, wavelength and periodicity.
2. Represent key changes and relationships between key signatures with graphs.

D. Apply Algebraic Techniques

1. Use algebraic techniques to determine tempos and number of measures needed to create music of a given duration.
2. Use functions to map one melody or rhythm into a transformed melody or rhythm.
3. Apply modular arithmetic to the concept of octave equivalence and equivalence classes.

Note: The instructor reserves the right to change the syllabus at any point of time during the semester.

Tentative Schedule (based on 16-week course)

Week	Topics
1/18	Reading rhythms and fractions
1/25	Permutations
2/1	Combinations
2/8	Using graphs with music: key signatures, alternative scales
2/15	Counting melodies, beats, orchestrations
2/22	**Test 1;** Interpreting and manipulating graphs of sound waves
2/29	Octave equivalence, pitch classes, equivalence classes
3/7	Modular Arithmetic
3/14	Spring Break
3/21	Symmetry in music
3/28	Groups in music
4/4	Polyrhythms in world music (West African, Indian, Afro-Cuban), and least common multiples
4/11	**Test 2;** Tuning systems and alternative scales
4/18	Stochastic music and Markov chains
4/25	Mathematics in 20th-21st century composition and rock music
5/2	Review for
5/11	Final (Wednesday, 3-5pm)