Department of Mathematical Sciences
M 105
Contemporary Mathematics (for Music Enthusiasts)

Course: M 105 Sec. 11 (CRN 73907) 3 cr., Autumn 2012
Contemporary Mathematics
TΘ 12:40–2:00pm in MATH 108

Instructor: Mark Kayll
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Office: MATH 209
406.243.2403

Hours: M 2:10–3:00pm, Th 2:10–3:00pm & by appointment (tentative) (open for all course matters, including DSS accomm.)

Prerequisites: either: M 090 (MAT 005, Introductory Algebra) with a minimum B− grade;
or: M 095 (MAT 100, Intermediate Algebra); or: appropriate placement score;
and: appropriate background in music, plus an open mind.


Material: Three separate units, based on: Numbers & Music; Mathematics & Music; Probability & Music. We'll use portions of the text as well as handouts.

Important Dates: Labor Day (no classes) Monday, 3 September;
last day to add by CyberBear w/o consent Wednesday, 5 September (5pm);
last day to add/drop by CyberBear, or select Audit grade option Monday, 17 September (5pm);
last day to add/drop w/o dean's sig Monday, 29 October (5pm);
Election Day (no classes) Tuesday, 6 November;
Veterans’ Day (observed) Monday, 12 November;
Thanksgiving vacation 21–23 November;
last day to add/drop by petition Friday, 7 December (5pm);
Last class meeting (during finals) Monday, 10 December 3:20–5:20pm.

Description: Mathematics 105 usually breaks into several independent topics, such as ‘Symmetry’, ‘Statistics’, and ‘Social Choice’. The topics of this special section will all revolve around ‘Math & Music’. Here are some example questions to be considered: Why are there circles of fifths and fourths but not thirds or tritones?; What is equal temperament?; How is the chromatic scale related to modular arithmetic?; How is the musical staff like a logarithmic scale for pitch?; How are overtones related to the integers?; How does harmony derive from the overtone series?; What are the mathematical relationships between pitches in consonant intervals and chords?; What are the historical obstacles (going back to the Greeks) to tuning a musical scale that gives a mathematically precise harmony in all keys?

If any of these questions intrigue you, and you are looking to satisfy your general education mathematical literacy requirement, then this might be the course for you.

Key musical and mathematical concepts will be introduced/reviewed as they are encountered.

Learning goals: In December 2006, UM's Department of Mathematical Sciences adopted the following learning goals for this course. These are reflected in the more-detailed description above:
1. To attain some degree of mathematical literacy, including an ability to read mathematical material and write using mathematical notation correctly. To develop skills to think and reason mathematically in order to function more effectively in the modern world;
2. To examine ways in which mathematics is used, to follow and understand logical arguments, and to solve applied quantitative problems. This includes learning to formulate a problem precisely, to interpret solutions, and to make critical judgments in the face of competing formulations and solutions;
3. To understand elementary probability concepts and phenomena: including sample spaces with equally likely outcomes, the basic parameters (mean, standard deviation), the normal distribution, and a qualitative view of the Central Limit Theorem;
4. To understand elementary statistical concepts, such as data description, statistical estimation, randomization, and statistical inference;
5. To explore and examine several other aspects of contemporary mathematics. This could include, but is not limited to, management science (e.g. graph models for network problems), social choice and decision making (e.g. elections, voting, fair division, Congress apportionment), or applied geometry (e.g. symmetry, tilings, growth rates).

Free tutoring: Math@Mansfield, Mansfield Library main floor
Monday–Thursday: 11:00am–3:00pm; Friday: 10:00am–12:00pm
Class attendance & activities: Attendance will be taken and will contribute to the “in-class work” portion of the grade. Class activities will include: discussion, group work, and lectures. Often group work will consist of worksheets which will also contribute to the “in-class work”. Participation is necessary; learning mathematics is similar to learning to play a musical instrument or a new sport: one learns by doing, not by watching.

Readings: Reading the text and handouts is essential for this course. Short pop quizzes based on the readings will be given, to encourage students to remain current.

Homework: Problems will be assigned based on the in-class work. Solution keys will be distributed after homework is due. Homework problems will be discussed regularly in class. Assignments will be collected and checked, but individual problems will not normally be graded. Keep in mind that the only way to learn mathematics is to do mathematics. This means that students should be prepared to spend some quality time thinking about mathematics.

I urge you from the outset to get into the habit of staying on schedule with your reading and homework. This will help you to maximize the material you’re able to absorb in class, meaning less effort in preparing for tests.

Assessment: Course grades will be based on homework assignments, in-class work, and three term tests. Traditional letter grades will be assigned using the +/- system (see UM catalog at www.umt.edu/catalog/acad/acadpolicy/default.html). UM’s policy on Incomplete grades will be followed (see UM catalog).

Tentative grading schedule:

<table>
<thead>
<tr>
<th>Item</th>
<th>Date(s)</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>28 August — 7 December</td>
<td>20%</td>
</tr>
<tr>
<td>In-class work</td>
<td>28 August — 7 December</td>
<td>20%</td>
</tr>
<tr>
<td>Test # 1</td>
<td>Thursday, 27 September</td>
<td>20%</td>
</tr>
<tr>
<td>Test # 2</td>
<td>Thursday, 1 November</td>
<td>20%</td>
</tr>
<tr>
<td>Test # 3</td>
<td>Monday, 10 December</td>
<td>20%</td>
</tr>
</tbody>
</table>

Accommodation: If you are a student with a disability who will require reasonable program modification in this course, please meet with Disability Services for Students in Lommasson 154 for assistance in developing a plan to address program modifications. If you are already working with Disability Services, please arrange to meet with me during my office hours to discuss reasonable modifications that may be necessary. For more information, visit the Disability Services website at life.umt.edu/dss.

General Remarks

On credit: If you’re taking this course as a general education requirement, you must choose ‘traditional letter grade’, not CR/NCR. A ‘D−’ grade is considered passing and will earn course credit, but it will not fulfill the Gen Ed requirement. A minimum grade of ‘C−’ is needed to fulfill the Gen Ed math literacy requirement.

On homework: You may work with others on homework problems, and you are encouraged to do so; however,

Solutions should be written down privately in your own words.

On tests: Each test will be based on the material from one of the three units we will study.

On make-ups: Make-ups for tests will not be given unless there is a valid excuse cleared with the instructor prior to the test. At least one of your most detrimental homework/in-class work scores will be dropped; thus, there will be no make-ups for quizzes, homework, or class work.

On deadlines: Any stated deadlines will be firm; please do not ask for extensions.

On pets: Please do not bring pets to class.

On electronic devices: Cell phones must be turned off during class meetings and office hour visits. If you need a calculator during a test, a separate device from your cell phone must be used.

On conduct: All students need to be familiar with the Student Conduct Code; it can be found in the ‘A to Z Index’ on the UM home page. All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the university.