Math/CS 415, Graph Theory and Combinatorics Fall 2017

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Office Hours: By appointment
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Prerequisite: Math 213 or Math 322 or permission from instructor.


Material: See course announcement.

Lectures: MWF 1:00 - 1:50 pm, 341 Classroom Building

Midterm: There will be an in-class midterm tentatively scheduled on Wednesday, October 6, 2017.

Final Exam: Tuesday, December 12, 2017, 8:00 am to 10:00 am. The final exam is cumulative.

Homework: Homework will be assigned, but not collected. If I receive a grader for the course, I will be collecting homework.

General Advice: In order to learn the course material, you are expected to read and understand the material from the text and lectures, as well as to complete all of the homework exercises.

Quizzes: On non-exam week Fridays you will take a 15 minute quiz at the end of class. The quiz will be on material from the previous week’s Monday, Wednesday and Friday lectures.

The lowest two quiz grades will be dropped. If you miss a quiz due to an absence (excused or not), this will be one of the two quiz grades which will be dropped.

Attendance: Students are expected to attend all of the lectures.
Your attendance grade is computed by the number of lectures you attend divided by the total number of lectures.

Faculty Senate Rule 5.2.4.2 defines acceptable reasons for excused absences to be:
(a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor. As required by University rules, you must present full documentation in order to request makeup work for a valid absence. Senate Rule 5.2.4.2 states that faculty have the right to request "appropriate verification" when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to University-related trips or a major religious holiday is required no later than 7 days prior to the absence.

Grading Scale: Each component of your coursework (quizzes, exam 1, exam 2, final) will be curved using the scale:

A 90-100%, B 80-89%, C 70 - 79%, D 60-69%, E Below 60%.

Pluses will be awarded if you are at the upper end of a particular grade, while minuses for being at the lower end.

Midterm Grade: I will report your midterm grade using your letter grade on the midterm exam.

Course Grade: Each component of your coursework (homework, quizzes, midterm, final) will be given a letter grade ranging from A+ to E, where A+ = 4.3, A = 4.0, A– = 3.7, B+ = 3.3, B = 3.0, ..., E = 0. Your course grade will be computed using the following weighted average of the letter grades:

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attendance</td>
<td>15 %</td>
</tr>
<tr>
<td>Quizzes</td>
<td>20 %</td>
</tr>
<tr>
<td>Midterm</td>
<td>30 %</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35 %</td>
</tr>
</tbody>
</table>

At the instructor’s discretion, a particular component of your coursework may be curved.

Cheating: Don’t do it. It is an extremely serious offense. As a minimum response, I will give a zero to the offender.

No cellphones, computers or calculators allowed during exams. By University policy the use of such constitutes cheating.

Laptops and/or cellphones are not allowed to be used at anytime in the classroom without the instructor’s prior consent. An exception is any university-wide emergency notification sent via cellphones.

Plagiarism: Plagiarism includes copying from outside sources, including internet sources. If charged, at minimum you will receive a zero. Maximum penalties include being suspended, dismissed or expelled from the University. For further information, consult the Faculty Senate rules.
Classroom Decorum: Code of Student Conduct (AR 4.10), Section V, Letter J, Instructional Setting Behavior:

“Students who engage in conduct that results in disruption of an instructional setting may be directed by the instructor to leave the class for the remainder of the instructional setting period.”

Examples include but are not limited to reading email during class, texting, taking phone calls, updating your facebook page, using a fidget spinner, reading the newspaper, interrupting classmates and speaking aloud without being called upon. An attitude of respect for and civility towards other students in the class and the instructor is expected at all times. If what you are doing would be inappropriate behavior on a job interview, then it is very likely inappropriate behavior in the classroom.

The instructor reserves the right to modify this syllabus at any time.

Last updated August 22, 2017.
Here are a few puzzles:

- Coin weighing problems. The classical puzzle from World War I (used as a weapon): Given 12 coins, where one is counterfeit. With a balance scale and three weighings find the fake coin.

- The fifteen game: The puzzle of tiles numbered 1 through 15 in a 4 by 4 square. Can you get them in correct order without removing any of them?

- Instant insanity: Four cubes with four colors on their sides. Can you place them in a tower such that you see all four colors on each side.

- The stable marriage theorem: Can you match $n$ women and $n$ men such that there will be no divorces. (Alternatively, match medical residents with hospitals.)

In this course we will learn and apply basic Graph Theory and Combinatorics to solve these types of puzzles. Topics include:

- Basic theory of counting.
- Stirling and Bell numbers. (And a magic trick based upon the fifth Bell number is 52.)
- Eulerian and Hamiltonian paths and cycles in graphs.
- Tree counting.
- Euler’s formula for planar graphs.
- The chromatic polynomial of a graph.
- Basic Ramsey theory.
- Permutations.
- Generating functions.

Prerequisite: Math 213 or Math 322.