Fall 9-1-2021

M 485.01: Graph Theory

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UNIVERSITY OF MONTANA

Department of Mathematical Sciences

M 485
Graph Theory

Course: M 485 Sec. 01 (CRN 73799) 3 cr., Autumn 2021
Graph Theory
TΘ 9:30–10:50am in MATH 311

Instructor: Mark Kayll
Econtact: mark.kayll@umontana.edu
umontana.zoom.us/j/6948539958 (in case of remote OH)
hs.umt.edu/math/people/default.php?s=Kayll
Office: MATH 209
406.243.2403
Hours: T 3:00–3:45pm, Θ 2:00–2:50pm & by appointment
(*tentative*) (open for all course matters, including ODE accomm.)

Prerequisites: M 325 (Discrete Math), or M 307 (Intro Abstract Math) & M 361 (Discrete Optimization), or consent of instructor.
Students should have background appropriate for senior-level mathematical studies. Though we shall begin from first principles, we'll assume that students have—or can learn quickly—basic knowledge of elementary graph theory.

Text: J.A. Bondy and U.S.R. Murty, *Graph Theory*, Springer, 2008 [ISBN-13 978-1-84628-969-9].

Important Dates:

Labor Day Holiday	Monday, 6 September;
last day to add w/o instructor consent	Wednesday, 8 September (5pm);
last day to drop or select Audit grade option	Monday, 20 September (5pm);
last day to drop via Add/Δ/Drop link and avoid 'WP' or 'WF'	Monday, 1 November (5pm);
Veterans' Day Holiday	Thursday, 11 November;
Thanksgiving Break	24–26 November;
last day to add/drop by petition	Friday, 10 December (5pm);
last class meeting (during finals)	Tuesday, 14 December 10:10am–12:10pm.

Description: This is a senior-level treatment of graph theory. We'll quickly cover the basics (graphs and subgraphs) and follow the text into this rich subject. An outline of the topics to be covered may be constructed by sampling the Table of Contents: connected graphs, trees, connectivity, planarity, stable sets and cliques, vertex and edge colorings, matchings, and Hamilton cycles. Depending on time and student interest, additional, or fewer, topics may be covered.

Graph theory forms part of the foundation for computer science and as such is an essential branch of modern mathematics. This holds not only for math majors, but for majors in almost any of the other STEM disciplines. Students might also consider that UM-Missoula is the only Montana University System campus that offers this course.

Learning outcomes: The 'official' outcomes below are reflected in the description above.

- Explain the basic concepts, terminology, and notation of graph theory;
- Explore in depth several graph-theoretic themes;
- Explain the basic applications of graph theory;
- Construct and present mathematical proofs at the level of sophistication of a 400-level math course.

Accommodation: The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (ODE). If you anticipate or experience barriers based on disability, please contact the ODE at 406.243.2243, ode@umontana.edu, or visit www.umt.edu/disability for more information. Retroactive accommodation requests will not be honored, so please do not delay. The instructor will work with you and the ODE to implement an effective accommodation, and you're welcome to contact the instructor privately if you wish.

Assessment: Course grades are based on homework assignments, two term tests, and a final exam. Traditional letter grades will be assigned using the +/− system (see *UM catalog* at catalog.umt.edu/academics/policies-procedures). UM's policy on Incomplete grades will be followed (see *UM catalog*).

(over)

Homework Assignments are set regularly, roughly every two weeks. A (possibly improper) subset of the assigned problems will be graded. We may use `gradescope.com`, depending on course logistics. If so, the instructor will share a course number and entry code. Students are responsible for compiling their own 'solution sets', comprised of their own submissions, augmented by notes from meetings with other students and with the instructor.

I urge students from the outset to get into the habit of staying on schedule with reading and homework. This helps to maximize the material absorbed in class, meaning less effort in preparing for tests.

Graduate increment: Assigned work and examinations for graduate students, though overlapping those of the undergraduate students, will be more extensive and will probe the mathematical theory more deeply.

***Tentative* grading schedule**

Item	Date(s)	Weight
Homework	31 August — 9 December	30%
Test # 1	Tuesday, 5 October	20%
Test # 2	Thursday, 4 November	20%
Final exam	Tuesday, 14 December 10:10am–12:10pm	30%

Teaching modality: This course is face-to-face. The instructor is prepared to shift to Zoom should the need arise, as dictated by the pandemic status.

Moodle pages: These are located at `moodle.umt.edu/course/view.php?id=47254`. The instructor plans to post there (e.g. announcements, homework, grade book, etc.).

General Remarks

On homework: Please use complete sentences, proofread, and polish your work prior to submission. You're encouraged to type homework solutions unless your handwriting is clear. You may work with others on homework problems, and you're encouraged to do so.

Solutions should be written down privately in your own words.

If you use an important idea of someone else, then please acknowledge that person by giving an appropriate citation in your write-up. This professional courtesy will not affect your grade.

On exams: As noted above, there are two in-class tests and a final exam. The latter will be cumulative with a slight emphasis on the material not covered by the in-class tests.

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 your most detrimental assignment will be dropped; thus, there are no homework make-ups.

On deadlines: Any stated deadlines are firm; please don't ask for extensions.

On electronic devices: Cell phones must be silenced during class meetings and office hours. Use of a cell phone during a test for any purpose other than as a calculator is grounds for earning a zero score on that test.

On coronavirus: Masks are required in the classroom & during office hours; students feeling sick or exhibiting COVID-19 symptoms shouldn't attend class and instead contact Curry (CHC: 406.243.4330). UM recommends obtaining a vaccine; please visit the CHC. Students required to isolate or quarantine will receive support for continued academic progress. Specific seating arrangements are in place; attendance/seating is recorded photographically to support contact tracing. Consuming food or beverages is discouraged in the classroom.

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.

Combinatorics is the most fundamental, and hence the most important, branch of mathematics, since it deals with FINITE structures, and the world is finite.
Doron Zeilberger, *Board of Governors Professor of Mathematics*
Rutgers University