



MATH 4300 A (CRN 511)
Graph Theory
Fall Semester 2019

Instructor: Allen G. Fuller

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Office location: Instructional Complex 240

Office hours:

Monday: 9:00-9:30; 12:00-1:00

Wednesday: 9:00-9:30; 12:00-1:00

Thursday: 1:00-3:00

Friday: 9:00-11:00; 2:00-3:00

And by appointment

Class Location: Instructional Complex 310

Class Times: 1:00-1:50 Monday,
Wednesday, Friday

Course Description:

Survey of topics in graph theory including Euler and Hamiltonian paths, shortest paths, maximum flow, trees, spanning trees, and matching and coloring problems.

Pre or Co-requisites: MATH 3200

Required materials:

- **CALCULATOR:** A graphing calculator is required. A Texas Instruments TI-83/TI-84 or higher or equivalent is recommended.
- **TEXT:** Gould, Ronald. 2012. *Graph Theory*. Dover. ISBN: 978-0-486-49806-5

Specific Learning Outcomes:

Upon completion of this course, successful students will demonstrate understanding of graph theory. In particular, successful students will demonstrate an understanding of and apply their knowledge of:

1. Combinatorial graphs and basic properties.
2. Recognizing and using graph-theoretic ideas.
3. Graph invariants and their uses.
4. Different kinds of graphs.

Grade Scale:

89.5% +	79.5 – 89.4%	69.5 – 79.4%	59.5 – 69.4%	Less than 59.5%
A	B	C	D	F

Grading Scheme:

Assignments	20%
Test I	25%
Test II	25%
<u>Final Exam</u>	<u>30%</u>
TOTAL	100%

Assessments:

- A. There will be take-home assignments given during the semester. Assignments are due at the beginning of class on the date due. ***Late assignments will not be accepted.*** However, I will drop your lowest assignment grade. Just having the correct answer to an assignment question will NOT earn you credit for the problem; you must use clear mathematical reasoning and clear mathematical writing to show me how you arrive at your solution. If a question asked for a numerical answer or a characterization, you will need to prove that your answer is correct not just give the answer.
- B. There will be a two in-class tests on Wednesday, September 25 and Friday, November 1. **If a make-up test is required, there will be 20% penalty unless there is a documented medical excuse or documented death in the immediate family.** A make-up test **must** be taken within **48 hours** of your return to class or by the last day of class (whichever comes first), after which you receive a grade of zero
- C. There will also be a comprehensive Final Examination given Thursday, December 12, 2019, 12:30 PM – 2:30 PM. A student who does take the final examination will receive a grade of WF for the course. Gordon College policy states the Final Examinations must be taken at the scheduled time with the following exception. Students who have three or more finals on the same day may petition to take the third and/or fourth exam on another day or days. Student Petition forms are available in the Academic Affairs Office (Lambdin Hall 347). Please make your plans accordingly.
- D. If your grade on the Final Exam is higher than your highest test score, then the grade on the Final Exam will replace your lowest test score.

Student Rights and Responsibilities:

- A. **Title IX:** Gordon State College is committed to providing an environment free of all forms of discrimination and sexual harassment, including sexual assault, domestic violence, dating

violence and stalking. If you (or someone you know) has experienced or experiences any of these incidents, know that you are not alone. All faculty members at Gordon State College are mandated reporters. Any student reporting any type of sexual harassment, sexual assault, dating violence, domestic violence or stalking must be made aware that any report made to a faculty member under the provisions of Title IX will be reported to the Title IX Coordinator or a Title IX Deputy Coordinator. If you wish to speak with someone confidentially, you must contact the Counseling and Accessibility Services office, Room 212, Student Life Center. The licensed counselors in the Counseling Office are able to provide confidential support. Gordon State College does not discriminate against any student on the basis of pregnancy, parenting or related conditions. Students seeking accommodations on the basis of pregnancy, parenting or related conditions should contact Counseling and Accessibility Services regarding the process of documenting pregnancy related issues and being approved for accommodations, including pregnancy related absences as defined under Title IX.

- B. **ADA and 504:** If you have a documented disability as described by the Americans with Disabilities Act (ADA) and the Rehabilitation Act of 1973, Section 504, you may be eligible to receive accommodations to assist in programmatic and/or physical accessibility. The Counseling and Accessibility Services office located in the Student Center, Room 212 can assist you in formulating a reasonable accommodation plan and in providing support in developing appropriate accommodations to ensure equal access to all GSC programs and facilities. Course requirements will not be waived, but accommodations may assist you in meeting the requirements. For documentation requirements and for additional information, contact Counseling and Accessibility Services at 678-359-5585.
- C. **House Bill 280:** For information regarding House Bill 280, see the University System of Georgia at the following link: <http://www.usg.edu/hb280>.
- E. **Religious Holidays:** Gordon State College acknowledges that the academic calendar can sometimes conflict with major holidays from among our diverse religious traditions. If a student must miss class due to the observance of a religious holiday, that absence may be excused. To be excused, the student must inform his/her instructors before the absence and make alternate arrangements for any work due at the time of the absence. An excused absence for the observance of a religious holiday does not excuse student from responsibility for required course work.
- F. **Hightower Collaborative Learning Center & Library:** The Hightower Collaborative Learning Center & Library offers Gordon State students specialized library research assistance. Students can meet with their personal librarians for one-on-one help in each discipline, major, or course to search and evaluate information sources effectively. Go to <http://libcal.gordonstate.edu/> to schedule an appointment by clicking the **Personal Librarian** tab or click on the **Presentation Practice Room** tab to make a reservation. For immediate help, call **678-359-5076** or stop by the Circulation/Check-Out Desk. You can also

[Ask a Librarian](#) or drop by the Circulation/Check-Out Desk. Check the library's for [website](#), hours, electronic resources, and LibGuides (subject- or class-specific research guides).

Additional Information:

- A. This course is an introduction to non-calculus based statistics. Emphasis is on the applied rather than the theoretical side of statistical analysis. This course will help you become a more thoughtful, critical consumer of quantitative information, and a clear, effective interpreter and communicator of quantitative information. These objectives are achieved through an intensive but appropriate use of graphing technology. A Texas Instrument (TI-83/TI-84 Plus) is recommended. I will be using a TI-84 Plus in class. You are expected to bring your own calculator to class and to all tests and the final exam.

This course will emphasize student preparation, critical thinking, and problem solving. To do well in the course, you must **study (not just read) the assignment ahead of time** and prepare questions, do suggested problems from the text, and prepare for test by reviewing those problems worked in class and at home. Over the course of the semester, you should devote about two hours of outside work for each hour in class. Introductory Statistics demands your time and effort! **First, study the examples worked in class as well as those in the e-text, then practice, practice, practice problems.**

This course, as many other courses, will emphasize the written communication of ideas to others. In this course, you will be communicating mathematical ideas. Just as it is important in an English course to use the proper format in your essays and term papers, it is important to use proper form when communicating mathematical ideas. You will learn how to write mathematics so that it can be understood by others. You should carefully study how mathematics is written in class as well as how it is written in the textbook. You should pattern your writing after these sources.

- B. **Attendance:** Attendance at class is important. I will take attendance by passing an Attendance Sheet for you to sign. If your signature is not beside your name for a particular day, you are considered absent. It is your responsibility to make sure you sign the Attendance Sheet. Students are responsible for every instruction, every change in the syllabus, and all material covered in class whether or not they are present. Students who enroll in the course late are responsible for material covered before they enrolled.
- C. **Tardiness:** Tardiness to class is NOT tolerated. I will give you a grace period of approximately five minutes to come into the classroom. During that time the door to the classroom will be left open. After that time, I will close the door to the classroom. If the door of the classroom is closed, you may not enter. **DO NOT ENTER THE CLASSROOM AFTER THE DOOR HAS BEEN CLOSED.**
- D. **Attire:** As in all professional environments, appropriate dress is required in the classroom. I reserve the right to refuse you admittance to class if I deem your attire to be inappropriate and/or distracting. Please dress appropriately.

- E. **Working Problems:** Most students will benefit by working many, many problems for practice. On the Tentative Course Outline is a list of suggested “Practice Problems” for each section covered. These are intended to give the student practice in specific concepts that are taught in class. The problems will not be graded. However, I strongly encourage you to work them to better prepare for the tests. I will use approximately the first ten minutes of class to answer any questions about the homework problems. Math is not a spectator sport!
- F. **Group Work:** I encourage students to work together on homework.
- G. **Academic Honesty:** Each student must do his or her own work on exams without any assistance from any outside source not specifically authorized by me. The student handbook details school policies on academic honesty.
- H. **Calculator Policy:** A graphing calculator is required for this course. The TI-83 or TI-84 is recommended. Please bring your calculator for all tests. I will not provide calculators for your use. Also, sharing calculators during a test will be considered cheating. Calculators that can manipulate symbolically, e.g. the TI-89 or TI-92, are NOT allowed during tests.
- I. **Electronic Devices Policy:**
1. **Cell Phone Use:** Studies show that use of a cell phone or similar device during lecture strongly impairs a student’s ability to take notes and remember information later, and that students significantly underestimate how much cell phone use impairs their ability to learn (Sana et al [2]). In class texting has been linked to an average drop of half a letter grade in a course (Kamenetz [1]). Furthermore, use of electronic media by students reduces the ability of other students near them to take notes by 17% (Sana et al [2]).
Use of cell phones or other electronic communication devices during lecture is prohibited, except where explicitly allowed by the instructor. Unauthorized use can result in a loss of some or all of a student’s participation points for the day, at the discretion of the instructor.
[1] A. Kamenetz. “How to get students to stop using their cellphones in class”. NPR Ed, Nov 10 2015.
[2] F. Sana, T. Westin, and N. Cepada. “Laptop multitasking hinders classroom learning for both users and nearby peers”. *Computers and Education*,62:24-31, Mar 2013.
 2. **Electronic Devices During Tests and Quizzes:** The use of electronic devices (iPhone, iPad, smartphones, tablets, laptops, iPods, etc.) is prohibited during quizzes and tests.
- J. **Testing Procedure:** You will be asked to leave books and other personal items at the front of the room during tests and exams. For that reason, you may want to leave expensive electronic devices and other valuable articles in cars or at home. The instructor will remain

in the classroom during tests and exams, but he/she cannot guarantee the safety of easily pocketed items.

- K. **Statute of Limitations:** While the instructor does his best to accurately review and assess student work, instances may occur where an error in assigning a grade may occur. The student has exactly three class periods from the time of receiving a grade to ask the instructor to review the grade. After this time has elapsed, all grades will be considered carved in stone.
- L. **Classroom Etiquette:** Students are expected to treat the instructor and other students with respect. Please refrain from the following during class time:
1. Talking with other students (other than during classroom or group activities).
 2. Leaving class early (other than an emergency).
 3. Leaving the desk to sharpen a pencil in the middle of a lecture.
 4. Cell phones ringing during class. Placing or receiving cellular phone calls during class.
 5. I-pods or other music listening devices should NOT be in use during class time.
- M. **Gordon E-mail:** Your Gordon e-mail address is where all official communication from Gordon College is sent. This includes registration information, etc. Please check your Gordon e-mail account periodically for important information. You should also delete junk e-mail to keep your mailbox from getting full. If your mailbox is full, you may not receive important e-mail notifications. Also, if I need to communicate with you via e-mail, I will send the message to your Gordon e-mail account.
- N. **Office Procedures:** When you come to my office for help, please be prepared by doing the following.
1. Bring you class notes and your calculator.
 2. Make sure you have read the section in the text, read the class notes, and studied the examples.
 3. Be prepared to show me at least two odd-numbered problems from the section that you have worked.
 4. Bring your incomplete or incorrect solution to each problem about which you have a question.
 5. Ask for help as early as possible. **Don't wait until the day of a test! I will NOT help you if you come for help the day of the test!!**
- O. **Harry's House:** The mission of [Harry's House](#) is to distribute food and toiletries to students to alleviate stress associated with short term food insecurity and other financial constraints in order to effectively reduce hunger and support educational success.

Tentative Lecture Schedule:

Week of	Monday	Wednesday	Friday
Aug 19	1.1: Fundamental Concepts and Notation	1.1 (concluded)	1.2: Elementary Properties and Operations
Aug 26	1.2 (concluded)	1.3: Alternate Representations for Graphs	1.4: Algorithms
Sep 2	<u>Labor Day Holiday – No Class</u>	1.5: Degree Sequences	1.6: Fundamental Counting
Sep 9	Catch-up Day	2.1: Distance	2.1 (concluded)
Sep 16	2.2: Connectivity	2.2 (concluded)	2.4: Problem Solving and Heuristics
Sep 23	Catch-up Day	TEST I	3.1: Fundamental Properties of Trees
Sep 30	3.2: Minimum Weight Spanning Trees	3.3: Counting Trees	3.6: Binary Trees
Oct 7	4.1: Flows	4.2: The Ford and Fulkerson Approach (Midterm 10/10/2019— Last day to withdraw and get W)	4.3: The Dinic Algorithm and Layered Networks
Oct 14	4.6: Connectivity and Networks	Catch-up Day	5.1: Eulerian Graphs
Oct 21	5.2: Adjacency Conditions for Hamiltonian Graphs	5.3: Related Hamiltonian-like Properties	5.4: Forbidden Subgraphs
Oct 28	5.6: The Traveling Salesman Problem	Catch-up day	TEST II
Nov 4	6.1: Euler's Formula	6.2: Characterizations of Planar Graphs	6.2 (concluded)
Nov 11	6.3: A Planarity Algorithm	Catch-up Day	7.1: Matchings and Bipartite Graphs
Nov 18	7.1 (concluded)	8.1: Vertex Independence and Coverings	8.2: Vertex Colorings
Nov 25	<u>Thanksgiving Holiday – No Class</u>		
Dec 2	8.3: Approximate Coloring Algorithms	8.5: The Four Color Theorem	Catch-up day
Dec 9	Review for Final Exam		
Final Exam on Thursday, December 12, 2019, 12:30 PM – 2:30 PM			