**Mathematics 4300 A (CRN 207)**

**Graph Theory**

Fall Semester 2017

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

Instructional Complex 207

**Instructor:**  Dr. Allen G. Fuller

**Office:** Instructional Complex 240

**Office Hours:**
- Monday: 11:10-12:10
- Tuesday: 1:00-2:00; 3:30-4:30 (STEM Center)
- Wednesday: 11:10-12:10
- Thursday: 1:00-2:00; 3:30-4:30 (Student Success Center)
- Friday: 11:10-12:10; 3:10-4:10
- And by appointment

**Office Phone:** 678 359-5830

**E-mail:** a_fuller@gordonstate.edu

**Web Page:** http://faculty.gordonstate.edu/a_fuller/

**Prerequisite:** MATH 3200

**Credit:** 3 semester credit hours

**Calculator:** Graphing calculator required. TI-84 recommended.


**COURSE DESCRIPTION**

This course includes a variety of topics in introductory graph theory. The topics include Euler and Hamilton paths, shortest paths, maximum flow, trees, spanning trees and matching and coloring problems.

This course will emphasize student preparation, critical thinking, and problem solving. To do well in the course, you must **read the assignment ahead of time** and prepare questions, do 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. Number Theory demands your time and effort! **First, study the examples worked in class as well as those in the textbook, 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.

**COURSE OBJECTIVES**

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.

**METHOD OF EVALUATION**

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 Friday, September 15 and Friday, October 27, 2017.

C. There will also be a comprehensive Final Examination given on Friday, December 1, 2017 at 1:30 PM. 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. The student's final grade will be computed as follows:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
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<tbody>
<tr>
<td>Assignments</td>
<td>20%</td>
</tr>
<tr>
<td>Test I</td>
<td>25%</td>
</tr>
<tr>
<td>Test II</td>
<td>25%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

E. The following grading scale will be used.

- 89.5 or above  A
- 59.5 to 69.49  D
- 79.5 to 89.49  B
- Below 59.5     F
- 69.5 to 79.49  C

**CLASS PROCEDURES**

A. **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.

B. 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.**

C. 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.

D. Working Problems: Since most students benefit by working many, many problems for practice, I encourage you to try other problems from the textbook in addition to the take-home assignments (graded homework). The more problems you work the better prepared for the midterm and final you will be. Math is not a spectator sport!

E. Group Work: I encourage students to work together on homework.

F. 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.

G. 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 and quizzes. I will not provide calculators for your use. Also, sharing calculators during a test or quiz will be considered cheating. Calculators that can manipulate symbolically, e.g. the TI-89 or TI-92, are NOT allowed during tests and quizzes.

H. 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.

I. 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.

J. 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.

K. Electronic Devices Policy: The use of electronic devices (iPhone, iPad, smartphones, tablets, laptops, iPods, etc.) is prohibited during class and testing.

L. 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.

M. 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.

**Office Procedures**

When you come to my office for help, please be prepared by doing the following.
   1. Bring your textbook, your calculator, and you class notes.
   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!**
<table>
<thead>
<tr>
<th>Week of</th>
<th>Monday</th>
<th>Wednesday</th>
<th>Friday</th>
</tr>
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<tbody>
<tr>
<td>Aug 7</td>
<td></td>
<td>1.1: Fundamental Concepts and Notation</td>
<td>1.1 (concluded)</td>
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<tr>
<td>Aug 14</td>
<td>1.2: Elementary Properties and Operations</td>
<td>1.2 (concluded)</td>
<td>1.3: Alternate Representations for Graphs</td>
</tr>
<tr>
<td>Aug 21</td>
<td>1.4: Algorithms</td>
<td>1.5: Degree Sequences</td>
<td>1.6: Fundamental Counting</td>
</tr>
<tr>
<td>Aug 28</td>
<td>Catch-up Day</td>
<td>2.1: Distance</td>
<td>2.1 (concluded)</td>
</tr>
<tr>
<td>Sep 4</td>
<td><em>Labor Day Holiday – NO CLASS!!</em></td>
<td>2.2: Connectivity</td>
<td>2.2 (concluded)</td>
</tr>
<tr>
<td>Sep 11</td>
<td>2.4: Problem Solving and Heuristics</td>
<td>Catch-up Day</td>
<td>TEST I</td>
</tr>
<tr>
<td>Sep 18</td>
<td>3.1: Fundamental Properties of Trees</td>
<td>3.2: Minimum Weight Spanning Trees</td>
<td>3.3: Counting Trees</td>
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<td>Oct 2</td>
<td>4.3: The Dinic Algorithm and Layered Networks</td>
<td>4.6: Connectivity and Networks</td>
<td>Catch-up Day</td>
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<tr>
<td>Oct 9</td>
<td><em>Fall Break, Oct 12 &amp; 13 – NO CLASS!!</em></td>
<td>5.1: Eulerian Graphs</td>
<td>5.2: Adjacency Conditions for Hamiltonian Graphs</td>
</tr>
<tr>
<td>Oct 16</td>
<td>5.2 (concluded)</td>
<td>5.3: Related Hamiltonian-like Properties</td>
<td>5.4: Forbidden Subgraphs</td>
</tr>
<tr>
<td>Oct 23</td>
<td>5.6: The Traveling Salesman Problem</td>
<td>Catch-up day</td>
<td>TEST II</td>
</tr>
<tr>
<td>Oct 30</td>
<td>6.1: Euler’s Formula</td>
<td>6.2: Characterizations of Planar Graphs</td>
<td>6.2 (concluded)</td>
</tr>
<tr>
<td>Nov 6</td>
<td>6.3: A Planarity Algorithm</td>
<td>Catch-up Day</td>
<td>7.1: Matchings and Bipartite Graphs</td>
</tr>
<tr>
<td>Nov 13</td>
<td>7.1 (concluded)</td>
<td>8.1: Vertex Independence and Coverings</td>
<td>8.2: Vertex Colorings</td>
</tr>
<tr>
<td>Nov 20</td>
<td>8.3: Approximate Coloring Algorithms</td>
<td><em>Thanksgiving Holiday, Nov 25, 26, &amp; 27 – NO CLASS!!</em></td>
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<td>Nov 27</td>
<td>8.5: The Four Color Theorem</td>
<td>Review for Final Exam</td>
<td>Final Exam</td>
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<td>Fri, Dec 1, 1:30 PM</td>
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