



**GOSHEN COLLEGE**  
**MATHEMATICS DEPARTMENT**  
**MATH 355 GRAPH THEORY – SPRING 2019**

**Description** An introduction to the concepts and techniques of graph theory with application to diverse areas such as management, computers, circuitry, communications, and social networks. Topics covered include graphs and digraphs, paths and circuits, graph and digraph algorithms, trees, cliques, planarity, duality and colorability. Although expected to do both, students will have some opportunity to emphasize writing code or writing proofs.

**Learning Objectives** The student will

1. State and use definitions and theorems related to graphs, algorithmic complexity, and data structures to solve problems;
2. Explore examples, make conjectures, and write code and proofs;
3. Learn mathematics by reading, listening, exploring, and conversing in an effective manner;
4. Explain mathematical reasoning through writing in a precise and articulate manner in both informal and formal settings; and
5. Exhibit curiosity, playfulness, creativity, confidence, perseverance, interest in multiple perspectives, and a collaborative spirit.

**Prerequisites** A grade of C or higher in Math 211 Calculus I and either Math 205 Discrete Mathematics or Math 212 Calculus II.

**Activities** The study of mathematics is not a spectator sport! Reading, listening, solving problems, writing explanations, reflecting upon ideas, and receiving feedback are essential to learning mathematics. Read with paper and pencil in hand, and take an anticipatory approach: try to obtain solutions, explanations, and proofs before reading what the author provides. Write down specific questions when you do not understand a portion of the text or a lecture.

An announced portion of the text should be read in preparation for each class. The goal for class time is to deepen and extend the understanding already obtained from the reading. Come to class prepared, be attentive and respectful, engage in activities, offer ideas, ask relevant questions, and suggest possible answers.

Exercises will be assigned regularly to verify and expand your understanding. Collaboration is encouraged, but each student must submit their own solutions. Individual exercise solutions can be resubmitted or submitted late by the class period after the first submissions are graded and returned to students, but a 30% penalty will be assessed on these resubmissions and late submissions. When resubmitting work, include the originally graded work.

A midterm exam and a cumulative final exam will evaluate your understanding of and ability to use graph theory definitions, theorems, data structures, and algorithms. There may be take-home portions in addition to the in-class closed-book portions.

An average student can obtain an average grade with an average of nine hours each week (including class time) devoted to a 3-credit hour course—adjust if you are not average or desire a grade that is not average.

**Instructor** David Housman, SC 117, dhousman@goshen.edu, 535-7405, 612-7185 (cell)  
Office hours posted on office door and [www2.goshen.edu/~dhousman/Schedule19Spring.htm](http://www2.goshen.edu/~dhousman/Schedule19Spring.htm)

**Class Time** MWF 8:00-8:50 p.m. in SC 107.

**Textbook** *Algorithmic Graph Theory* by Alan Gibbons, Cambridge University Press, ISBN: 0-521-28881-9. We will cover most of this concisely written book.

<b>On-line</b>	Moodle <a href="https://moodle.goshen.edu">https://moodle.goshen.edu</a>
<b>Software</b>	Sage (sagemath.org) and its collaborative notebook interface CoCalc (cocalc.com) will be used for computation. Free basic private server access will be provided.
<b>Notebook</b>	A three-ring binder with loose-leaf lined and graph paper is recommended so that you can keep a written record of problem solving attempts, questions, math discoveries, and skill assessments.
<b>Grading</b>	Course grades will be based on class participation (10%), assignments (60%), a midterm exam (10%), and a comprehensive final exam (20%). If helpful, the final exam grade will replace either the class participation or midterm exam score.
<b>Extra Credit</b>	Receive extra credit toward your assignment grade by doing one or more of the following: (1) find errors in the text or posted course materials and describe the error in a post to the Questions and Answers forum; (2) attend a quantitative presentation (e.g., <a href="#">Science Speakers</a> ) or participate in a quantitatively based activity and describe in writing some interesting mathematical aspect of the presentation or activity; or (3) participate in a <a href="#">Career Services</a> event and describe your most important discovery. The description should be a substantive paragraph or two and be submitted to the instructor on paper.
<b>Tutoring</b>	The Academic Success Center provides tutoring and writing support for free to all undergraduate students. Make an appointment at <a href="http://goshen.edu/asc">goshen.edu/asc</a> . Unfortunately, no current student has previously taken this course. Therefore, your best bet to receive assistance is to make use of David's office hours.
<b>Disability Services</b>	Goshen College is committed to providing all students equal access to programs and facilities. Students who need accommodations based on disability should contact the Director of the Academic Success Center (ASC). Students must register with ASC before faculty are required to provide reasonable accommodations. For more information or to register, please contact the Director of the ASC, Judy Weaver, Good Library 112, <a href="mailto:jweaver@goshen.edu">jweaver@goshen.edu</a> or 574-535-7560. To ensure that learning needs are met, contact the director of the ASC the first week of classes.
<b>Collaboration and Academic Integrity</b>	<p>You are encouraged to use all available resources in order to learn the concepts and techniques discussed in this course. In particular, conversations with other students and the instructor can be an effective learning method. Reading other books and web pages can be another effective learning method. However, copying someone else's work subverts the learning process.</p> <p>For assignments, you may look at and discuss another student's work, but any written work developed during collaboration with another student should be destroyed before writing your own solutions. You should give written acknowledgement to people with whom you have had discussions and to any written materials (other than the text) that were helpful.</p> <p>For exams, you may <i>not</i> use any resources unless a specific exception is stated by the instructor.</p> <p>Failure to observe the above rules will result in a zero on the assignment or exam. Any violation of academic integrity will be reported to the Academic Dean. Observation of the above rules will help you learn the material well and give you the satisfaction of knowing that you have earned your grade.</p>
<b>Due Date Policy</b>	Class participation, assignments, and exams can only be excused, rescheduled, or made up if (1) there is a serious medical problem, a death in the immediate family, or an irreconcilable conflict with another official Goshen College activity; (2) there is written documentation signed by proper authorities; and (3) the instructor is notified prior to the due date or as soon as possible afterwards.