### 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. Students will be expected to answer questions and solve problems individually and collaboratively.

Exercises will be assigned and typically due the next class period to verify and expand your understanding. Typically, assigned problems 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.

There will be a midterm exam and a cumulative final exam to evaluate your individual understanding of the statements and uses of the definitions and theorems. 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 devoted to this 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, 875-0339 (home)
See office door or Moodle for availability.

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

### Textbook

### On-line
[https://moodle.goshen.edu](https://moodle.goshen.edu)
Software | Wolfram *Mathematica* will be used for computation and is available from any campus networked computer. If desired, you can purchase or rent a student license for your personal computer at http://www.wolfram.com/mathematica/how-to-buy/education/students.html.

Notebook | 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.

Grading | 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.

Extra Credit | 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., Science Speakers) 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 Career Services event and describe your most important discovery. The description should be a substantive paragraph or two and be submitted to the instructor.

Tutoring and Disabilities | Goshen College wants to help all students be as academically successful as possible. If you have a disability and require accommodations, please contact Lois Martin, the Director of the Academic Resource & Writing Center early in the semester. In order to receive accommodations, documentation concerning your disability must be on file with the Academic Resource & Writing Center, Good Library 112, x7576, lmartin@goshen.edu. All information will be held in the strictest confidence. The Academic Resource & Writing Center offers tutoring and writing assistance for all students. For further information please see http://www.goshen.edu/campuslife/arwc/.

Collaboration and Academic Integrity | 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.

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.

For exams, you may *not* use any resources unless a specific exception is stated by the instructor.

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.

Due Date Policy | Class participation, assignments, labs, 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.