



**GOSHEN COLLEGE**  
**MATHEMATICS DEPARTMENT**  
**MATH 205 DISCRETE MATHEMATICS - FALL 2020-21**

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<b>Motivation</b>	Scientists, economists, and others use mathematics to create models and perform calculations to gain a better understanding of the world. Mathematicians use abstraction and deductive reasoning to analyze quantity, shape, and structure. Math 212 Calculus II (continuous structures) and this course (discrete structures) help you transition from a user of mathematics to a creator of mathematics.
<b>Catalog Description</b>	An introduction to mathematical thinking and reasoning. Topics include number systems and arithmetic, logic and Boolean algebra, functions and relations, set theory, algorithms, combinatorics and probability, matrices, and elementary graph theory. An emphasis is placed on problem solving and proof techniques. Recommended background: four years of high school mathematics, including some calculus or Math 211.
<b>Learning Objectives</b>	<p>The student will</p> <ol style="list-style-type: none"><li>1. Use truth tables, symbolic logic, and proof schema to analyze and write definitions, conjectures, and proofs (logical thinking);</li><li>2. Describe informal representations, state formal definitions, and provide examples and nonexamples of basic set, matrix, relation, function, and graph concepts, and use these concepts to solve problems (relational thinking);</li><li>3. Use and create recursive definitions to solve problems, and use mathematical induction to prove theorems (recursive thinking);</li><li>4. Use addition and multiplication principles to count discrete structures and algorithmic steps (quantitative thinking);</li><li>5. Create, code, execute, and analyze algorithms (algorithmic thinking);</li><li>6. Learn mathematics by reading, listening, exploring, and conversing in an effective manner (learning modes);</li><li>7. Explain and critique mathematical reasoning through speaking and writing in a precise and articulate manner in both informal and formal settings (communication);</li><li>8. Exhibit curiosity, playfulness, creativity, confidence, perseverance, interest in multiple perspectives, and a collaborative spirit (dispositions).</li></ol>
<b>Instructor</b>	David Housman, SC 117, dhousman@goshen.edu, 535-7405. Office hours posted on office door and on Moodle
<b>Class</b>	MWF 8:00-8:50 a.m. in SC 107. Attendance and participation are expected. For students who are unable to attend class in person for legitimate reasons, remote participation via Zoom or a video equivalent will be available. A recording of the Zoom class session or the video equivalent will be available for any student to watch. Class activities will complement, not substitute, for the reading, problem solving, and concept discussing students engage in outside of class.
<b>Textbook</b>	<i>Applied Discrete Structures</i> , by Al Doerr and Ken Levasseur, Cengage Learning, Chapters 1-10. This is available as a free pdf at <a href="https://faculty.uml.edu/klevasseur/ads2/">https://faculty.uml.edu/klevasseur/ads2/</a> . Optional print version: ISBN: 978-1-365-93358-5.
<b>On-line</b>	Moodle <a href="https://moodle.goshen.edu">https://moodle.goshen.edu</a> contains all course information. Announcements posted to the forum will be emailed to all students. CoCalc <a href="https://cocalc.com">https://cocalc.com</a> will be used for computation.
<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>Activities</b>	<p>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. If you do not understand something, write a question that is as specific as possible. Describe from memory the key concepts and techniques.</p> <p>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.</p> <p>Moodle will announce the preparation for a class and the graded assignment to be completed before the next class. The preparation will typically involve reading a portion of the textbook and attempting some exercises that have</p>

full or partial answers in the textbook. During class, students and the instructor will summarize the important concepts and techniques, ask and answer questions about the material covered, and solve additional problems. All students will verify the correctness of solutions, ask questions, and provide personal insights. Students should bring to class paper and writing instruments, an iPad, or some other device as an aid to solving problems, and recording concept discoveries, questions, and assessments of your learning, problem solving, and collaboration performances.

**Grading** Course grades will be based on assignments (35%), three midterm exams (45%), and a comprehensive final exam (20%). If helpful, the final exam grade will replace the lowest midterm exam score.

**Assignments** Achieve and exhibit understanding by completing the assigned exercises. You are encouraged to collaborate and seek assistance when having difficulties; however, you should eventually write your own solutions. You will have achieved the expected level of understanding when you are able to obtain your own solutions, independently reproduce solutions developed in collaboration or with assistance, and/or explain a solution to others. Assignments will be collected at the beginning of almost every class. Rewrites and late submissions will be assessed a 30% penalty and typically be due the second class after the original due date.

**Exams** Exhibit your ability to solve problems and describe mathematical concepts without assistance or collaboration. Typically, there will be both closed-book in-class and open-book take-home portions.

**Extra Credit** Receive extra credit toward your assignments grade by doing one or more of the following: (1) find errors in the textbook or posted course materials and describe the error in writing; (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. For any of these activities, the description should be at least one substantive paragraph and be submitted to the instructor on paper or via email.

<b>Topics</b>	<b>Chapters</b>	<b>Exam Date</b>
Set Theory and Combinatorics	1 – 2	Friday, September 11
Logic and Proof	3 – 4	Friday, October 2
Matrices, Relations, and Functions	5 – 7	Friday, October 30
Everything including Recursion, Graphs, and Trees	1 – 10	Fri, Nov 20, 8:00-10:00am

**Disability and Tutoring Services** 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, [jweaver@goshen.edu](mailto:jweaver@goshen.edu) or 574-535-7560. To ensure that learning needs are met, contact the director of the ASC the first week of classes. The ASC provides individual tutoring by appointment at [tutorcal.goshen.edu](http://tutorcal.goshen.edu).

**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 specified 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** 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.

**Course Materials are for Private Use** Course materials (videos, assignments, exams, problem sets, etc) are for use in this course only. You may not upload them to external sites, share with any person outside this course, or post for public commentary without written permission from the professor. Sharing recordings outside of the class could lead to a copyright or FERPA violation. Goshen College prohibits any student from duplicating, downloading, or distributing class recordings with anyone outside of this class, for any reason.