Math 2100 / 2105 / 2350 – Fall 2018
Discrete Mathematics and Foundations of Mathematics

My Contact Information

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Lectures:	TuTh, 11:00am - 12:15pm, in Cudahy 120
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Course Description

This course is an introduction to abstract mathematics through the lens of discrete mathematics, a field centered on the study of mathematical objects such as sets, functions, and graphs. We will learn many techniques that allow one to rigorously prove mathematical facts, and we will apply those techniques to the study of discrete mathematics. Emphasis is placed on logical, abstract thinking and clear and precise mathematical writing.

Textbook

Discrete Mathematics: Mathematical Reasoning and Proof with Puzzles, Patterns, and Games, by Douglas E. Ensley and J. Winston Crawley. There is only one edition of this book.

D2L

Some course materials will be posted on D2L, and may be accessed through https://d2l.mu.edu. All other course material will be posted on our course page. Please do not email me through the D2L system. Since the D2L system cannot accommodate grading scales like ours, students should use the course score sheet to track their grades.

Specifications-Based Grading

Assessment in this course will be based on the model of *Specifications-Based Grading*, or *Spec Grading*. The primary goals of spec grading are:

- Emphasize understanding over memorization
- Reduce student stress

- ≻ Provide students with more concrete feedback about their progress in this course, and allow students to have more control of their grade
- ≻ Create clear expectations

Quick Overview

Course grades will be based on your level of performance in five categories of work, each of which will be explained in more detail below.

1. Homework
2. Quizzes
3. Exams
4. Class Participation
5. Demonstration of Productive Failure

Questions on homework, quizzes, and exams will be graded on the **EMPI** scale (explained below), and students will have the opportunity to submit revisions to homework, quiz, and exam questions (except the final exam) for rescoring. If the revised score is lower than the original score, the better score will always be kept.

EMPI Scale

Your solution to each question on a homework assignment, quiz, or exam will be given a grade of **E**, **M**, **P**, or **I** based on the criteria below (adapted from http://eric.ed.gov/?id=EJ717675).

Excellent	Contains no mathematical errors Demonstrates complete understanding Written clearly and concisely, and in logical order Contains very few spelling or grammatical errors
Meets Expectations	Contains few mathematical errors Contains no significant mathematical errors Understanding is evident Writing is mostly clear and concise, possible issues with logical order Contains few spelling or grammatical errors
(Still) **P**rogressing	Demonstrates partial understanding, but significant gaps remain — Further teaching is necessary Contains significant mathematical errors Writing is unclear, unnecessarily verbose, or out of logical order Contains significant spelling or grammatical errors
Incomplete	Solution not attempted or only partially completed Demonstrates very little or no understanding Writing is completely unclear or illegible

Homework

Homework will be assigned each Thursday and collected the following Thursday, except in the case of breaks, holidays, or exams. Altogether, there will be twelve homework assignments. Each homework assignment will consists of 4-6 questions.

Two questions will be chosen from each assignment to be graded on the **EMPI** scale. Additionally, the assignment as a whole will receive a grade based on completion according to the following scale.

- ≻ **C** (Complete): An honest attempt has been made on all questions.
- ≻ **SC** (Somewhat Complete): An honest attempt has been made on at least four questions.
- ≻ **NC** (Not Complete): An honest attempt has been made on fewer than four questions.

So, each homework assignment will receive three scores: one of **C**/**SC**/**NC** based on completion, and two on the **EMPI** scale based on the correctness of the two randomly chosen questions.

Each day I will suggest several *recommended exercises* from the textbook. These will not be collected or graded, but completing them will be valuable for your understanding of the material and preparing for quizzes and exams.

Quizzes

A very short quiz consisting of two questions will given on most Thursdays. Each quiz will cover the material from Thursday of the previous week and Tuesday of the current week unless otherwise announced in class. The purpose of these quizzes is to check that material is being retained as the course progresses, and questions can range from stating important definitions to proving theorems similar to those from class. Each of the two questions will be graded on the **EMPI** scale.

Exams

There will be two in-class midterm exams and a final exam. Each question on the exams will be graded on the **EMPI** scale. Since I don't know yet how many questions will be on each exam, the letter grade goals for exams will be based on a percentage of questions, rather than a fixed number.

Homework/Quiz/Exam Revision

One of the most important features of spec grading is that students are given the opportunity to reassess and revise their work so that they can demonstrate complete understanding of the material.

All revisions are due in class, within one week of the day that the graded assignment is returned. If you miss class when I return the assignment and pick it up later, your revision is still due one week from when I passed the assignment back to the rest of the class. Deadlines may be extended at my discretion in the case of class holidays.

Any homework question that does not receive the score **E** can be revised and resubmitted. If the resubmission still does not receive the score **E**, then it can be rerevised and reresubmitted within a week

of the graded resubmissions being distributed to the class. Solutions can be revised and resubmitted an arbitrary number of times, subject to the one-week deadlines. If the revised score is lower than the original score, the better score will always be kept.

Any homework solution that has been left blank, or that only contains gibberish or irrelevant information, will be marked as Not Revisable, and such questions cannot be revised and resubmitted. This is to prevent people from turning in blank assignments to receive automatic one-week extensions. As long as you make a good faith effort on a question, you will have the opportunity to revise and resubmit.

Any quiz question or exam question that does not receive the score of **E** can be revised and resubmitted subject to the same one-week deadline conditions as homework. However, resubmitting a quiz question costs *1 Token* and resubmitting an exam question costs *2 Tokens*. (See below for information about tokens.) If you need to resubmit the same question more than once, you must spend the tokens each time.

Class Participation

We will spend a significant part of class time working on exercises in groups. Afterward, I'll ask for volunteers to present their solutions to the class on the board, while explaining their steps and answering any questions that the rest of the class might have. I expect each student to present at least two problems on the board during the term.

Demonstrating Productive Failure

One of the most profound benefits of a spec grading system is that students have the opportunity to evaluate and revise their own work by analyzing their thought process, figuring out where they went wrong, and determining how to avoid similar mistakes in the future. By going through this process, each of you will discover more about your own learning styles. By the end of the course, the revise/resubmit process will teach you to be more efficient, effective, and productive learners.

When you resubmit assignments, I will ask you to write a quick sentence or two about what went wrong the first time, and how you can prevent similar mistakes in the future. Please take time to reflect honestly on these critical questions.

At the end of the course, I will ask you to write a brief note about how you've learned from this process. You will be considered to have *Demonstrated Productive Failure* if you've written this note and can demonstrate that you've thought carefully during the semester about your learning process and your study methods.

Grade Assignments

Your final grade in the course will be based on your performance in each of the 5 categories of assessment. **To achieve a particular letter grade, you must meet or exceed *all* benchmarks for that grade.**

	To earn an **A**	To earn a **B**	To earn a **C**	To earn a **D**
Homework Completion: (12 assignments)	$\geq$ 10 **SC/C** $\geq$ 8 **C**	$\geq$ 9 **SC/C** $\geq$ 7 **C**	$\geq$ 8 **SC/C** $\geq$ 6 **C**	$\geq$ 6 **SC/C**
Homework Correctness: (24 scores)	$\geq$ 22 **M/E** $\geq$ 14 **E**	$\geq$ 20 **M/E** $\geq$ 12 **E**	$\geq$ 18 **M/E** $\geq$ 10 **E**	$\geq$ 16 **M/E**
Quizzes: (20 scores)	$\geq$ 17 **M/E** $\geq$ 8 **E**	$\geq$ 15 **M/E** $\geq$ 7 **E**	$\geq$ 13 **M/E** $\geq$ 6 **E**	$\geq$ 10 **M/E**
Exams: (3 exams)	$\geq$ 80% **M/E** $\geq$ 40% **E**	$\geq$ 70% **M/E** $\geq$ 35% **E**	$\geq$ 60% **M/E** $\geq$ 30% **E**	$\geq$ 50% **M/E**
Class Participation:	Present twice	Present once	Present once	*no requirement*
Demonstrate Productive Failure:	Demonstrate productive failure	Demonstrate productive failure	*no requirement*	*no requirement*

If you meet at least two of the requirements for a higher letter grade, your final grade moves from X to $X+$. If you meet at least four of the requirements for a higher letter grade, your final grade moves from X to $(X+1)-$ (for example, from B to $A-$).

Marquette does not offer the letter grades $D-$ or $F+$. As such, students who do not meet all of the criteria for a D will earn an F.

Tokens

Tokens may be earned by completing extra activities and spent on quiz/exam revisions and other advantages. Each student starts the course with 5 tokens.

Ways to earn tokens:

- $+1$: Present a problem in class. *(Can be earned at most four times per term.)* Students who have not yet presented two problems will have priority.
- $+1$: Come to office hours. *(Can be earned at most twice per term.)*
- $+1$: Study for a quiz or exam in a group of at least four students. *(Can be earned at most twice per term. To get credit for this, all students present should email me to tell me where and when they met, how they studied together, and whether they thought it was effective.)*
- $+1$: Write your homework in LaTeX. *(Can be earned at most three times per term.)*
- $+2$: Bring a mathematical news story to class and tell us about it in at most two minutes. *(Can be earned at most once per term. Email me first for approval. No duplicate news stories.)*
- I am open to other suggestions!

Ways to spend tokens:

- -1: Revise and resubmit a quiz question
- -2: Revise and resubmit a midterm exam question *(Note: final exam questions cannot be revised/resubmitted!)*
- -2: 24 hour extension on a homework assignment
- I am open to other suggestions!

Other Classroom Policies

Writing in Latex

Latex is a text editor that enables you to create good-looking mathematical documents. It is very commonly used in mathematics, computer science, physics, engineering, and other STEM fields. The course website will have some tutorial information and templates to help you get started, and I'm always more than happy to help out in office hours.

Grading Disputes

If you believe that I have made an error in scoring an assignment, you must bring it to my attention within one week of the graded paper being returned. I will carefully reread, and if necessary rescore, the assignment. Note that the one-week revise/resubmit deadline is still in effect, so if you think you may want to revise/resubmit, then you should bring the score to my attention before one full week.

Classroom Conduct

The classroom is an interactive learning environment in which everyone should feel valued and comfortable. I strongly encourage you to ask questions and give answers throughout the term, even if (particularly if!) you're not sure that your answers are correct. This is an important part of the learning process.

Students in past courses have often told me that they might peek at their phone, or get otherwise distracted, when they see something in the lecture that they already know. Then, they look up a few minutes later and realize that they're already lost and because math lectures build on themselves, they tend to stay lost for the rest of the class period. To prevent this, and in order to not distract your classmates, I ask that you keep your phones away.

Returned Papers

You must retain all returned papers in case of any discrepancy with the recorded grades on D2L. I cannot correct any mistakes in grading or recording of scores without the original document. All concerns regarding grades on assignments must be brought to me within one week of the return of the paper.

Homework Collaboration Policy

It can be very helpful to study and work with a group. This type of cooperative learning is encouraged; however, be sure that you have a thorough understanding of the concepts as well as the mathematical steps used to solve an exercise. You must be able to work through the exercises on your own. Each student must write up her or his assignment individually and independently and must turn in her or his own work. **All revisions of homework, quiz, and exam questions should be done independently, with no discussion between classmates.**

Accommodations and Special Needs

If you have a disability and require accommodations, please contact your instructor during the first week of class so that your learning needs may be appropriately met. You will need to provide documentation of your disability to the Office of Disability Services. If you are unsure of what you need to qualify for services, visit the Office of Disability Services' website at http://www.marquette.edu/disability-services or contact their office by phone at (414) 288-1645.

Excused Absences

Students with absences due to legal obligations, religious observances, or participation in Division 1 athletics and other university sanctioned events will be given an opportunity to make up examinations or other graded assignments, if a request is made to the instructor prior to the absence. After all absences, excused or unexcused, you are responsible for contacting your classmates to obtain lecture note and any other missed materials.