

# CSDS 302/MATH 304: Discrete Mathematics

Monday and Wednesday 12:45pm-2pm at Millis Schmitt Lecture Hall

## • Course Description

A general introduction to basic mathematical terminology and the techniques of abstract mathematics in the context of discrete mathematics. Topics introduced are mathematical reasoning, Boolean connectives, deduction, mathematical induction, sets, functions and relations, algorithms, graphs, combinatorial reasoning.

## • Topics

(corresponding to the course text: Discrete Mathematics with Applications, Susanna Epp, 5th Ed.)

### Chapter 1:

- 1.2 The Language of Sets
- 1.3 The Language of Relations and Functions

### Chapter 2:

- 2.1 Logical Form and Logical Equivalence
- 2.2 Conditional Statements
- 2.3 Valid and Invalid Arguments
- 2.5 Application: Number Systems and Circuits

Note: 2.4 Application: Digital Logic Circuits is covered in EECS 281

### Chapter 3:

- 3.1 Predicates and Quantified Statements I
- 3.2 Predicates and Quantified Statements II
- 3.3 Statements with Multiple Quantifiers
- 3.4 Arguments with Quantified Statements

### Chapter 4:

- 4.1 Direct Proof & Counterexample I: Introduction
- 4.2 Direct Proof & Counterexample II: Rational Numbers
- 4.3 Direct Proof & Counterexample III: Divisibility
- 4.4 Direct Proof & Counterexample IV: Cases, Quotient-Remainder Theorem
- 4.5 Direct Proof & Counterexample V: Floor and Ceiling.
- 4.6 Indirect Argument: Contradiction and Contraposition
- 4.7 Indirect Argument: Two Classical Theorems

### Chapter 5:

- 5.1 Sequences
- 5.2 Mathematical Induction I
- 5.3 Mathematical Induction II
- 5.4 Strong Mathematical Induction

## 5.6 Defining Sequences Recursively

### **Chapter 6:**

- 6.1 Set Theory: Definitions
- 6.2 Set Identities

### **Chapter 7:**

- 7.1 Functions Defined on General Sets
- 7.2 One-to-One and Onto, Inverse Functions

### **Chapter 9:**

- 9.1 Counting and Probability: Introduction
- 9.2 The Multiplication Rule
- 9.3 The Addition Rule
- 9.4 The Pigeonhole Principle
- 9.5 Combinations
- 9.6 r-Combinations with Repetition Allowed

### **Chapter 10:**

- 10.1 Graphs: Definitions and Properties
- 10.2 Trails, Paths, and Circuits
- 10.3 Matrix Representations of Graphs

Except the materials we will cover in the textbook, we will also have three special topics in mathematics and computer sciences. This semester, these three special topics are:

1. The Riemann Hypothesis
2. Infinity and Dimensions
3. Quantum Computing

**Special topics are not required in your tests, the first topic will be taught after first midterm, the second topic will be taught after second midterm, the last topic will be taught in the last day of the class.**

- **Prerequisites:**

MATH 122 or MATH 124 or MATH126

- **Instructor: Shuai Xu**

Email: [sxx214@case.edu](mailto:sxx214@case.edu)

Office: Zoom (personal Zoom ID: 918-696-9213, password is: 123456)

Office Hours: Monday and Wednesday 2pm-3pm

- **Course Textbook:**

The textbook is required for the homework. One of the skills you will develop in this course is the ability to read and use mathematical definitions. To develop that skill, not all definitions will be given during lectures, and you will need to look up the definitions in your textbook.

Discrete Mathematics with Applications, Susanna S. Epp, 5th Edition. (**REQUIRED TEXT**)

ISBN: 978-1337694193

### • Course Assessments:

#### Grading scheme:

Homework:	20%
Two Mid-term Exams:	50%
Final Exam:	30%

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### Homework:

Because mathematics is a discipline that must be practiced to be mastered, homework will be assigned each week.

In this course, the technique you use to solve the problem is more important than the final answer. *As a result, an answer that does not have a justification will receive 0 points.*

#### General rules:

- Please submit your homework on Canvas.
- Please only write in blue or black ink or pencil so that the grader may use a different color pen.
- Please make sure your homework is neat and *be kind to the graders*. The graders are other students and have limited time to read and understand your answer.
- **No late homework will be accepted.**

Unless specified otherwise, each homework question will be graded out of 8 points:

- 8: correct with a correct and easy to read justification
- 7: correct except for a minor mistake
- 6: correct technique but a major mistake
- 5: uses the correct technique in an incorrect, but reasonable way or a reasonable but incorrect technique
- 4: uses an incorrect technique from class
- 2: incorrect and does not use a technique from class in a reasonable way

- 0: does not make noticeable changes to the first submission or makes no real effort or *is an answer with no justification*

**Missed classes:** While you encouraged, but not required, to attend class. If you are going to miss class for a scheduled event such as a sporting competition, it is your responsibility to submit your homework *early*.

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All work submitted in this class is expected to be your own. While you are encouraged to study with another individual, you *must never* copy your answer from another person. Even if you discuss how to solve a problem with another person, be certain that you do the write up of your solution entirely on your own. **The hardest skill to master in this course is writing mathematics. It is only through trying to write the answers yourself that you will discover how well you understand the solution.**

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#### **Homework and Test Solutions:**

Solutions to select homework problems and test questions will be presented at the beginning of lecture. *No written solutions will be provided.* There are plenty of examples of written solutions in both the textbook and its supplemental solution manual. If you did not get an answer correct in a homework or test question, you are encouraged to try writing the solution again. You are welcome to show your new solutions to me for guidance. **It is only through writing that you will be able to master this material.**

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#### **Term tests:**

There will be two tests scheduled during the term: **Wednesday, Feb 21 from 12:45pm to 13:45pm (One hour)** and **Wednesday, March 27 from 12:45pm to 13:45pm (one hour)**. The tests will be in class, closed books and closed notes. Only four-function calculator can be used.

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#### **Final Exam:**

There will be a 3 hours final exam **Wednesday, May 8 from 8am to 11am**. The test will be cumulative, closed books, closed notes, and you will not be permitted to use a four-function calculator on the exam.

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#### **Grade scale:**

The class will use the following scale to translate your percentage grade to a final grade. There will not be a curve applied to the grades.

If your percentage grade is at least	Your final grade will be at least
90	A
80	B
70	C
60	D

*Minimum grade rule:* The minimum grade you can receive in the course will not be lower than two letter grades below your test and exam average.

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### **Academic Honesty**

Please see the general [University Policy on Academic Integrity](#). The specifics for the course are listed in the document, Honesty Policy, found on this site.

### **Special Considerations**

**Physical Disabilities or Other Hardships:** If you have a physical disability or other hardship that can potentially put you at a disadvantage in this course, please see [Educational Student Services](#). They will make certain you receive the necessary accommodations so that you may perform your best.

**Religious Holidays:** I strive to schedule all tests so that they do not conflict with important religious holidays. However, I am not always successful in doing that. If an important religious holiday conflicts with a class test or assignment in a way that makes it so that you cannot take the test or complete the assignment as originally assigned, please see me as soon as possible to make necessary arrangements.