

MAT287 Discrete Mathematics

(3 credit hours)

Course Syllabus

Course Description

This course provides students with an introduction to discrete mathematics with the focus on mathematical reasoning, basic understanding of sets, functions, relations, algorithms, counting methods, graph theory and methods of proof.

Course Learning Outcomes

By the end of this course, you will be able to:

1. Write and interpret mathematical notation and mathematical definitions.
2. Formulate and interpret statements presented in Boolean logic. Reformulate statements from common language to formal logic. Apply truth tables and the rules of propositional and predicate calculus.
3. Formulate short proofs using the following methods: direct proof, indirect proof, proof by contradiction, and case analysis.
4. Demonstrate a working knowledge of set notation and elementary set theory, recognize the connection between set operations and logic, prove elementary results involving sets, and explain Russell's paradox.
5. Apply the different properties of injections, surjections, bijections, compositions, and inverse functions.
6. Solve discrete mathematics problems that involve: computing permutations and combinations of a set, fundamental enumeration principles, and graph theory.

Required Textbook(s) and Resources

This course requires no textbooks. Instead, review the free resources linked in each weekly Explore section.

Optional Resources:

As an optional textbook, bookmark the following open source materials:

Bazett, T. (2017). Discrete math (full course: Sets, logic, proofs, probability, graph theory, etc.) [Video]. YouTube.

Levin, O. (2025). Discrete mathematics: An open introduction (4th ed.).
discrete.openmathbooks.org.

The YouTube playlist from Trefor Bazett consists of dozens of videos for a semester-long course on discrete math. Most range between 3-8 minutes and mirror the Levin textbook.

Also, check out the many YouTube videos for Kimberly Brehm's Discrete Mathematics Course. Her videos, as are our own PowerPoint presentations (and that of other cited resources), reflect the standard text below. Though it's not published as an open source (free) book, you can possibly find an inexpensive used copy or borrow it from a friend or library.

Rosen, K. H. (2019). Discrete mathematics and its applications (8th ed.). McGraw Hill.

Time Commitment

Effective time management is possibly the single most critical element to your academic success. To do well in this online class you should plan your time wisely to maximize your learning through the completion of readings, discussions, and assignments. Because of our accelerated, seven-week term, TU online courses are designed with the expectation that you dedicate a little over **six (6)** hours per credit hour to course activities and preparation **each week**. For example, for successful completion of a three-credit, seven-week online course you should reserve roughly **twenty (20) hours per week**.

To help plan your time and keep on track toward successful course completion, note the distinctive rhythm of assignment due dates:

1. All times assume Eastern Time (GMT-4).
2. Weeks begin at 12:00 a.m. ET on Monday and end at 11:55 p.m. ET on Sunday.
3. Unless otherwise noted, initial assignments or discussion posts are due by **11:55 p.m. ET on Wednesdays**.
4. Additional assignments or follow-up discussion posts are due by **11:55 p.m. ET on Saturdays, and**
5. Major assignments and reflections are typically due by **11:55 p.m. ET on Sundays**.

Learning Activities

To assess your learning, this course consists of weekly discussions, worth 35 points each (except for the final one, worth 40), and eight written assignments, worth 100 points each (except for the final reflection, worth 50). Like all TU online courses, the total possible score for the course is 1,000 points. There are no quizzes, exams, or extra credit assignments.

Grading

The chart below identifies the individual contributions from each type of activity, per week.

Activity	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Total
Discussions	35	35	35	35	35	35	40	250
Written Assignments	100	100	100	100	100	100	100	700
Reflection	--	--	--	--	--	--	50	50
Total	135	135	135	135	135	135	190	1000

Grading Scale

- A: 90-100%
- B: 80-89%
- C: 70-79%
- D: 60-69%
- F: <60%

Course Schedule and Weekly Checklist

Topic	Learning Activities (Due by 11:55 p.m. ET on day designated)
Week 1: Propositional Logic and Predicate Logic	☐ MON: Activity 1.1 (Forum): About Me ☐ WED: Activity 1.2 (Forum): Logic in Your Life ☐ SAT: Activity 1.2 Forum Responses ☐ SUN: Activity 1.3: Quantifier Detective
Week 2: Proofs	☐ WED: Activity 2.1 (Forum): Proofs in the Real World ☐ SAT: Activity 2.1 Forum Responses ☐ SUN: Activity 2.2: Proof Construction Challenge
Week 3: Sets and Functions	☐ WED: Activity 3.1 (Forum): Set Theory in the Wild ☐ SAT: Activity 3.1 Forum Responses

Topic	Learning Activities (Due by 11:55 p.m. ET on day designated)
	☐ SUN: Activity 3.2: Function Properties
Week 4: Sequences, Sums, and Matrices	☐ WED: Activity 4.1 (Forum): Patterns in Your World ☐ SAT: Activity 4.1 Forum Responses ☐ SUN: Activity 4.2: Matrix Mixer
Week 5: Number Theory and Cryptography, and Induction and recursion	☐ WED: Activity 5.1 (Forum): Modular Arithmetic in Real Life ☐ SAT: Activity 5.1 Forum Responses ☐ SUN: Activity 5.2: Prove It! Induction Challenge
Week 6: Relations	☐ WED: Activity 6.1 (Forum): Relations in Everyday Systems ☐ SAT: Activity 6.1 Forum Responses ☐ SUN: Activity 6.2: Matrix or Digraph? Exploring Relations Visually
Week 7: Graphs & Trees	☐ WED: Activity 7.1 (Forum): Graphs in Everyday Life ☐ SAT: Activity 7.1 Forum Responses ☐ SAT: Activity 7.2: Tree Traversal Challenge ☐ SUN: Activity 7.3: Course Reflection

Tips for Success

Online learning requires self-discipline and self-direction. As seekers of the truth, we should be willing to challenge one another's academic work in a spirit of respectful comradery. Your course is a place for you to grow as you benefit from the expertise, experience, and diverse perspectives of your instructor and peers. Constructive feedback will challenge you to stretch your own thinking, thereby expanding your knowledge and understanding.

To get the most out of your learning experience, you should actively engage (participate) in **ALL** course activities. Course elements are arranged chronologically. To complete a week, simply work your way "down the page" through all of the course materials and activities.

For More Information:

Be sure to review the [Support, Policies, and Procedures](#) addendum.