



## **MAT 159 Mathematical Reasoning and Proofs**

**Fall 2023**

**Course Credits:** 4

**Contact Hours:** 56 hours

**Instructor:** TBA

**Email:** TBA

### **COURSE OBJECTIVES**

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This course explores the art of constructing rigorous mathematical arguments, enabling students to think critically, solve complex problems, and communicate their ideas effectively. Topics include elements of logic, set theory, functions, equivalence relations, sets of integers, real and complex numbers, sequences and limits and more. Through a combination of theory, practice, and real-world applications, students will develop the skills necessary to create and evaluate mathematical proofs, enhancing their overall problem-solving abilities.

Upon Completion of this Course, students will be able to:

1. Gain the skills necessary to construct clear, rigorous, and logically sound mathematical proofs
2. Learn to break down complex problems into manageable steps and formulate solutions systematically
3. Equip with a comprehensive toolkit of proof techniques
4. Enhance the ability to think critically and logically, gaining skills to analyze mathematical statements, identify valid arguments, and construct sound proofs
5. Develop the skill to express mathematical ideas clearly and concisely

### **PREREQUISITES**

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N/A

### **GRADING**

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Grades will be determined by accumulating points, with 100 points being the maximum, as follows:



ITEM	POINTS
Assignments 2	20 Points
Midterm 1	15 Points
Midterm 2	15 Points
Final Project	20 Points
Final Exam	30 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

$$A \geq 90 > B \geq 80 > C \geq 70 > D \geq 60 > F.$$

We reserve the right to make adjustments to the overall grading policy.

## COURSE MATERIALS

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### **Required Texts:**

Gary Chartrand; Albert D. Polimeni; Ping Zhang, *Mathematical Proofs: A Transition to Advanced Mathematics*, 4th Edition, Pearson, 2018.

### **Recommended (Optional) Texts or Other Materials:**

None

## COURSE TOPICS

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MODULE	TASKS
Module 1	<b>Topics:</b> Topic 1: Logical Equivalence Topic 2: Some Fundamental Properties of Logical Equivalence Topic 3: Describing a Set Topic 4: Subsets <b>Assessments:</b> Assignment#1



Module 2	<b>Topics:</b> Topic 5: Set Operations Topic 6: Indexed Collections of Sets Topic 7: Partitions of Sets <b>Assessments:</b> Assignment#2
Module 3	<b>Topics:</b> Topic 8: Functions Topic 9: The Definition of Function Topic 10: One-To-One and onto Functions Topic 11: Bijective Functions <b>Assessments:</b> Midterm#1
Module 4	<b>Topics:</b> Topic 12: Equivalence Relations Topic 13: Properties of Equivalence Classes Topic 14: Direct Proof and Proof by Contrapositive Topic 15: Proof by Cases Topic 16: Proofs Involving Divisibility of Integers <b>Assessments:</b> Midterm#2
Module 5	<b>Topics:</b> Topic 17: The Real Numbers as an Ordered Field Topic 18: Complex Numbers Topic 19: Limits of Sequences Topic 20: Proofs in Linear Algebra <b>Assessments:</b> Final Project Final Exam

## ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to decrease in overall grade.

Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow University Academic Administration Office, the student might get a written warning and might be prohibited from attending final exam.



2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share with fellow colleagues.

### **LEARNING REQUIREMENTS**

- 1) Late assignments are not acceptable and are subjected to grade deductions.
- 2) Assignments submitted in the wrong format will be counted as not submitted.
- 3) Failure to submit or fulfill any required course component results in failure of the class.
- 4) Make-up for midterm and final exams only with valid excuses, as defined by the University.
- 5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

### **TECHNOLOGY POLICY**

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (eg., note taking, reading course documents).

### **ACADEMIC INTEGRITY POLICY**

Soochow University highly values the academic integrity and aims to promote the academic fairness, honesty and responsibility. Any academic dishonesty behaviors and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

### **DISABILITY ACCOMMODATION**



蘇州大學  
Soochow University

Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.

Note:

Please contact the University Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.