

COURSE: Introduction to Mathematical Reasoning
 TuTh 2:30pm-3:45pm in Sherman #011,
 Discussion Friday 1-1:50pm Math & Psychology # 008.

PROFESSOR: Hye-Won Kang
 Office: Math/Psych Building #424
 Email: hwkang@umbc.edu
 Office Hours: TBA
 I will try to respond to all emails in 2 business days. However during the weekends, I am not available to answer them.

TA: Fadlulah Omitogun

TEXT: (i) “Mathematics: A Discrete Introduction” by Edward R. Scheinerman, Third Edition.
 (ii) “Foundations of Higher Mathematics: Exploration and Proof” by Daniel Fendel and Diane Resek. Both textbooks are required.

COURSE DESCRIPTION:

This course develops fundamentals of mathematical logic and proof writing. Topics will include propositional logic, quantifiers, contradiction and contrapositive, induction, sets, relations, integers, functions, images and pre-images, bijections and inverse functions. LaTeX, a typesetting program for mathematical writing will be introduced. In addition to writing proofs, students will learn to assess the soundness of proofs written by others.

PREREQUISITE:

You must have completed MATH 221 with a grade of “C” or better.

GRADING POLICY:

Grades are based on homework and four exams. Homework includes class group activities on Friday. Final letter grade is decided based on the total grade as follows:

Letter Grade	Total Scores
A	$90 \leq \text{Total} \leq 100$
B	$80 \leq \text{Total} < 90$
C	$70 \leq \text{Total} < 80$
D	$60 \leq \text{Total} < 70$
F	$\text{Total} < 60$

However, factors such as overall distributions of grades or consistency in homework and midterm exams will affect on the final letter grade. Contributed portions of the total score are as follows:

	Homework	Exam 1	Exam 2	Exam 3	Final Exam	Total
Percentage	30%	15%	15%	15%	25%	100%

GOALS:

- Construct basic proofs of if-then statements about integers and sets.
- Evaluate the truth or falsity of given statements; defend this decision by providing justifications or counterexamples as appropriate.
- Manipulate and negate simple and compound mathematical statements using propositional logic and truth tables.
- Quantify (and negate) precise mathematical statements with proficiency in mathematical statements and propositions.
- Utilize common proof techniques such as induction, proof by contraposition, and proof by contradiction; recognize the need for these strategies in given problems.
- Apply skills of mathematical reasoning, as listed above, to topics including functions, probability, number theory, and group theory.
- Evaluate the validity of a given mathematical argument.
- Demonstrate correct and precise use of mathematical language.

LATEX:

This course requires the use of LaTeX for all assignments. LaTeX is typesetting software designed to format mathematical equations and notations clearly. While it may take some time to learn and become accustomed to, it will ultimately save you a lot of time when typing proofs and equations in mathematics. To obtain a LaTeX package for your personal computer, visit <https://www.latex-project.org/> or <https://miktex.org/>. Alternatively, you can use Overleaf for LaTeX typesetting, as it does not require installation. Visit <https://www.overleaf.com/> to get started. All homework must be completed in LaTeX.

HOMEWORK:

Weekly homework will be graded by three parts: assignments, worksheet on Friday, and self evaluation (modality rubric). All of them will be due by every Friday. There will be assignments from textbook problems. All weekly assignments need to be typed using LATEX. Please submit your assignment to TA. All problems in every homework will be graded. Copying from other students or a solution manual is PROHIBITED. Any violation will result in ZERO grade and will be reported to the University Academic Integrity Committee. Your ONE lowest homework score (for one week) will be dropped. Late homework will NOT be accepted.

APPROXIMATE SCHEDULE OF EXAMS:

Exam 1: 3/6 in class

Exam 2: 4/10 in class

Exam 3: 5/8 in class

Final Exam: TBA

You are NOT allowed to bring any cheat sheet or calculator during the exam.

MAKE UP EXAM AND MISSED EXAM POLICY:

In very emergency case only, you can ask for a make-up exam. You must notice to the instructor at least 7 days before the original exam date. Make-up exams will be taken before the original exam date. If you miss one of the exams, I do not think you can pass the course.

ATTENDANCE:

The attendance is not mandatory except for project preparation and presentation days, but is highly recommended. Based on the previous experience, students who attend every lecture have a very higher tendency to get a higher score at the end. When you come to the class, you are expected to participate in the class. I ask that you are on time and pay attention to the class. No excuse for being habitually late and the use of smartphones during class is strongly discouraged. Please do not distract yourselves and other students.

INCOMPLETE:

If you do complete the course successfully except for a very small portion due to very extraordinary and emergence situation (such as to stop attending school for the rest of the semester due to injury in an accident), you will be considered to get Incomplete. You are required to submit a written statement and evidence describing reason to get Incomplete. If the reason to get Incomplete is because you are behind in the course, I would recommend to drop the course, instead.

GETTING HELP:

There are lots of places you can get help. Tutoring is available through the Academic Success Center (<https://academicsuccess.umbc.edu>) and for athletes, the Athletic Department.

ACADEMIC INTEGRITY:

By enrolling in this course, each student assumes the responsibilities of an active participant in UMBC's scholarly community in which everyone's academic work and behavior are held to the highest standards of honesty. Cheating, fabrication, plagiarism, and helping others to commit these acts are all forms of disciplinary action that may include, but is not limited to, suspension or dismissal. See the Faculty Handbook, or the UMBC Policies section of the UMBC directory (<https://academicconduct.umbc.edu/>).

SAFETY PROTOCOLS AND COMPLIANCE:

"UMBC has set clear expectations for masking while on campus that include the requirement that you must wear a face mask that covers your nose and mouth in all classrooms regardless of your vaccination status. This is to protect your health and safety as well as the health and safety of your classmates, instructor, and the university community. Anyone attending class without a mask or wearing one improperly will be asked by the instructor to put on a mask or fix their mask in the appropriate position. Any student that refuses to comply with this directive will be asked to leave the classroom immediately and failure to do so will result in the instructor requesting the assistance of the University Police. Students who refuse to wear masks may be referred to Student Conduct and Community Standards and may face disciplinary action for violations of the Code of Student Conduct, specifically, Rule 2: Behavior Which Jeopardizes the Health or Safety of Self or Others and Rule 16: Failure to Comply with the Request of a University Official. UMBC's on-campus safety protocols, including masking requirements, are subject to change in response to the evolving situation with Covid-19."

APPROXIMATE COURSE SCHEDULE:

This course will cover various topics. The below is the APPROXIMATE schedule of the course which is subject to change. The changed schedule will be updated regularly on the course web page in Blackboard.

WEEK	DATES	TOPICS
1	Tu Jan 28 Th Jan 30	Course Introduction Sections 1, 2 (Intro), and 3 (Definition)
2	Tu Feb 4 Th Feb 6	(Online Lecture) Sections 4, 7 (If-Then, IFF, And, Or, Not) (Online Lecture) Section 5 (Proofs)
Friday, February 7, is the last day to withdraw from the course <u>without</u> receiving a 'W' on your transcript.		
3	Tu Feb 11 Th Feb 13	Section 6 (Counterexample) Section 10 (Sets)
4	Tu Feb 18 Th Feb 20	Section 11 (Quantifiers) Section 12 (Set operations)
5	Tu Feb 25 Th Feb 27	Section 12 (Set operations) Section 14 (Relations)
6	Tu Mar 4 Th Mar 6	Review Exam 1 (Sections 1-7, 10-12)
7	Tu Mar 11 Th Mar 13	Section 15 (Equivalence relations) Section 20 (Contradiction)
8	Tu Mar 18 Th Mar 20	Spring Break Spring Break
9	Tu Mar 25 Th Mar 27	Section 21 (Smallest counterexample) Section 22 (Induction)
10	Tu Apr 1 Th Apr 3	Section 22 (Induction) Section 40 (Groups)
Friday, April 4, is the last day to withdraw from the course <u>with</u> receiving a 'W' on your transcript.		
11	Tu Apr 8 Th Apr 10	Review Exam 2 (Sections 14, 15, 20, 21, 22)
12	Tu Apr 15 Th Apr 17	Lecture Recording: Section 24 (Functions) Section 26 (Composition of functions)
13	Tu Apr 22 Th Apr 24	Bijjective, injective, surjective Image and preimage
14	Tu Apr 29 Th May 1	Limits of sequences Function and limit examples
15	Tu May 6 Th May 8	Review Exam 3
16	Tu May 13 Th May 15	Review No class
17	May TBA	Final Exam (comprehensive)