MAT 224: Mathematical Reasoning and Proof
Spring 2021, MWF 11:30–12:20 PM, 133 Moffett Center

Contact Information:

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	Office:	123B Moffett Center
	Virtual Office Hours:	Wed. 1:00 - 3:00 PM
		Thurs. 12:00 - 3:00 PM

Textbook	*Mathematical Reasoning: Writing and Proof*, Ted Sundstrom Versio 2.1, ISBN: 978-1500143411
Prerequisites	A grade of C- or better in MAT 121 or MAT 135.

You are welcome to drop by my office anytime or schedule an appointment outside of office hours. The best way to schedule an appointment is via e-mail. I will do my best to respond to e-mails in a timely fashion, however **I am not guaranteed to respond to any e-mails sent after 5:00 PM on weekdays or on the weekends until the next business day.**

Course Goals and Description: This course will serve as an introduction to formal mathematical reasoning and proof. Major topics include methods of set theory, symbolic logic, combinatorics, relations and functions.

Student Learning Outcomes:: Upon successful completion of this course, students will be able to:

- Analyze formal mathematical arguments.
- Select and employ appropriate proof techniques to prove mathematical statements.
- Apply formal logic to negate statements and find contrapositions.
- Apply formal definitions to determine the truth of mathematical statements.

Course Website: This course will be using Blackboard. Useful links, assignments, announcements, and other files and information will be posted there. Students' grades will also be updated periodically via Blackboard. Assignments will be submitted through Blackboard.

Participation and Attendance: A major part of the learning experience is interacting with the material and fellow classmates. Students will periodically be doing work in-class in small groups, and as such **attendance is required**.

Homework: In order to gain a deep understanding of mathematics, it is necessary to practice working with the ideas and concepts. There will be weekly homework assignments due most Fridays. One of the more important aspects of mathematics is being able to convey ideas, methods, and conclusions in an efficient and coherent manner. To earn full points, students must submit organized responses which show all work and use complete sentences where appropriate. The lowest score will be dropped. Although it is often possible to find solutions in on line sources, any submitted homework must be your own work. You may discuss your homework with others, but whatever you turn in must be written in your own words. Any suspicion of plagiarism will result in a score of 0 on the assignment and a possible report of academic dishonesty to the college. **No late homework will be accepted under any circumstances.**

Exams: There will be three in-class exams and a final exam. The *tentative* weeks for the exams are **February 26, March 26, and April 23**. Students may use scientific calculators on the exams, however **no mobile devices, graphing calculators, or calculators with a computer algebra system (CAS) are allowed**. **Make-up exams will be given only in extreme circumstances (e.g. medical emergencies), with proper documentation required.** The lowest exam will be dropped.

Reading Reflections: This class will cover a significant amount of technical language and in some sense train you in "how to think" mathematically. As such, it is unlikely that you will fully grasp the concepts on first consideration or only through in-class time. Thus, there will be reading assigned most class periods. To ensure that you keep up with the reading, You will need to complete short (2-3 question) reading reflections before each class period. These are available on Blackboard. **Grading:**

	Participation		50
	Reading Reflections		50
	Homework		250
+	Three Exams	100 each	300
	Final Exam		150
	Total		800

Grade Scale Here are the cutoff point totals and corresponding percentages to guarantee various final grades.

A	744	93%	B+	696	87%	C+	616	77%	D+	536	67%
			B	664	83%	C	584	73%	D	504	63%
A-	720	90%	B-	640	80%	C-	560	70%	D-	480	60%

Students with final grades below 480 points can expect to receive an E in the course.

How To Succeed: In order to do well in the course, one should come to each class period ready to engage in class discussions and participate in group work with their peers. Reading the textbook to get a cursory knowledge of the topic for the day is crucial. A typical class will consist of a lecture reiterating the topics which were covered in the reading, and giving time for discussion as a group and questions. Time permitting, students will work on exercises in small groups. Learning is then solidified while completing the homework assignment for the week.

Getting Help: First and foremost, **ask questions!** If you are confused in class, then others will be too and will likely have the same questions as you. Asking questions is a crucial part of the learning process. If you find yourself struggling with a concept or need individual assistance, the best way to do this is by talking to the instructor during their office hours. Study groups are also strongly encouraged. Consider creating an email thread or group chat with other students in your class.

Cell Phones and Mobile Devices: Learning mathematics requires active engagement, and as such, you should not be using cell phones during class for any reason. If you have to take an emergency call, please leave the room as to not distract others. **You may not use your cell phone or any other device with an internet connection for a calculator**, and smart watches should be removed during exams. You may take notes on a tablet or laptop if you wish, but make sure it is not a distraction to others.

Makeups: Makeup exams may **only** be given in extreme circumstances or for university sanctioned reasons. Be prepared to provide supporting documentation. If your conflict involves an issue that you knew about ahead of time, then you are required to discuss it with the instructor before the scheduled exam. If a solution has not been discussed ahead of time, receiving a makeup will be unlikely.

Academic Integrity Statement: All students are expected to uphold academic integrity standards. Plagiarism is defined as taking the ideas of others and using them as one's own without due credit. Students who cheat in examinations, course assignments, or plagiarize in this course may be disciplined in accordance with university rules and regulations. (College Handbook, Chapter 340)

Disability Statement: As part of SUNY Cortland's commitment to a diverse, equitable, and inclusive environment, we strive to provide students with equal access to all courses. If you believe you will require accommodations in this course, please place a request with the Disability Resources Office at disability.resources@cortland.edu or call 607-753-2967. Please note that accommodations are generally not provided retroactively so timely contact with the Disability Resources Office is important. All students should consider meeting with their course instructor who may be helpful in other ways. (College Handbook, Chapter 745)

Diversity Statement: SUNY Cortland is dedicated to the premise that every individual is important in a unique way and contributes to the overall quality of the institution. We define diversity broadly to include all aspects of human difference. The College is committed to inclusion, equity, and access and thus committed to creating and sustaining a climate that is equitable, respectful and free from prejudice for students, faculty and staff. We value diversity in the learning environment and know that it enhances our ability to inspire students to learn, lead and serve in a changing world. We are committed to promoting a diverse and inclusive campus through the recruitment and retention of faculty, staff and students. As a community, we hold important the democracy of ideas, tempered by a commitment to free speech and the standards of inquiry and debate. To this end, we are dedicated to developing and sustaining a learning environment where it is safe to explore our differences and celebrate the richness inherent in our pluralistic society. (College Handbook, Chapter 130)

Inclusive Learning Environment Statement: SUNY Cortland is committed to a diverse, equitable and inclusive environment. The course instructor honors this commitment and respects and values differences. All students enrolled in this course are expected to be considerate of others, promote a collaborative and supportive educational environment, and demonstrate respect for individuals with regard to ability or disability, age, ethnicity, gender, gender identity/expression, race, religion, sex, sexual orientation, socio-economic status or other aspects of identity. In an environment that fosters inclusion, students have the opportunity to bring their various identities into conversation as they find helpful, but are not expected to represent or speak for an entire group of people who share aspects of an identity. If you have any questions or concerns about this statement, contact the Institutional Equity and Inclusion Office at 607-753-2263.

Title IX Statement: Title IX, when combined with New York Human Rights Law and the New York Education Law 129-B, prohibits discrimination, harassment and violence based on sex, gender, gender identity/expression, and/or sexual orientation in the education setting. The federal Clery Act and NY Education Law 129-B provide certain rights and responsibilities after an incident of sexual or interpersonal violence. When a violation occurs, victims and survivors are eligible for campus and community resources. Where the College has jurisdiction, it may investigate and take action in accordance with College policy. If you or someone you know wishes to report discrimination based in sex, gender, gender identity/expression, and/or sexual orientation, or wishes to report sexual harassment, sexual violence, stalking or relationship violence, please contact the Title IX Coordinator at 607-753-4550, or visit cortland.edu/titleix to learn about all reporting options and resources. (Updated by SUNY Legal Feb. 1, 2018).

Course Schedule:

This is a tentative schedule, and subject to change.

Week	Dates	Team	Sections Covered	Assignments Due
1	2/1	Alpha	Intro	
	2/3	Beta	1.1: Statements	
	2/5	Gamma	1.2: Constructing Direct Proofs	HW #1
2	2/8	Alpha	2.1: Statements and Logical Operators	
	2/10	Beta	2.2: Logically Equivalent Statements	
	2/12	Gamma	2.3: Open Sentences and Sets	HW #2
3	2/15	Alpha	2.4: Quantifiers and Negations	
	2/17	Beta	Catch Up/Review	
	2/19	Gamma	Catch-up/Review	HW#3
4	2/22	Alpha - EXAM 1		
	2/24	Beta - EXAM 1	Watch Introduction to Proof Techniques Video	
	2/26	Gamma - EXAM 1		
5	3/1	Beta	3.1: Direct Proofs	
	3/3	Gamma	3.2: More Proof Techniques	
	3/5	Alpha	3.3: Proof by Contradiction	HW #4
6	3/8	Beta	3.4: Using Cases in Proofs	
	3/10	Gamma	3.5: The Division Algorithm and Congruence	
	3/12	Alpha	4.1: Mathematical Induction I	HW #5
7	3/15	Beta	4.1: Mathematical Induction II	
	3/17	Gamma	Catch-up/Review	
	3/19	Alpha	Catch-up/Review	HW #6
8	3/22	Beta – EXAM 2		
	3/24	Gamma - EXAM 2	Watch Introduction to Sets Video	
	3/26	Alpha - EXAM 2		
9	3/29	Gamma	5.1:Sets and Operations on Sets	
	3/31	Alpha	5.2: Proving Set Relationships	
	4/2	Beta	5.3: Properties of Set Operations	HW #7
10	4/5	Gamma	6.1: Introduction to Functions	
	4/7	Alpha	6.3 Injections, Surjections, Bijections	
	4/9	Beta	7.1: Relations	HW #8
11	4/12	Gamma	7.2: Equivalence Relations	
	4/14	**Health Day**	**No Class**	
	4/16	Beta	Catch-up/Review	HW #9
12	4/19	Gamma - EXAM 3		
	4/21	Alpha - EXAM 3		
	4/23	Beta -EXAM 3		
13	4/26	Alpha	7.3: Equivalence Classes	
	4/28	Beta	9.1: Finite Sets	
	4/30	Gamma	9.2: Countable Sets	HW #10
14	5/3	Alpha	9.3: Uncountable Sets	
	5/5	Beta	Catch-up/Review	
	5/7	Gamma	Catch-up/Review	HW #11
15	5/10 – 5/14	**Finals Week**		