

Instructor: Dr. Chris Lee Trexler 270D clee@roanoke.edu

Office Hours: I am available for various office hours Monday through Thursday. All office hours are by appointment. To make an appointment, please use the link: <https://drchrislee.youcanbook.me>

Overarching Philosophy: Your ability to do Mathematics is not measured by a number stamped on your forehead at birth. Ability is a direct result of effort, and everything in this course is designed to encourage and reward maximum effort. No matter what your ability or grade is at any given moment, it can be changed through focused effort.

Intended Learning Outcomes: This course introduces both theoretical and applied mathematical topics not covered in a calculus course and introduces the ideas and techniques of formal logic and mathematical proofs. By the end of this course, successful students will be able to produce mathematical proofs, understand the different types of proofs, and critique proofs on correctness. Successful students will also understand the basics of graph theory and recursion.

Required Text: Textbook: Discrete Mathematics with Applications, 5th edition; Susanna Epp.

Community: Please feel free to become an active member of our department's community. Each of the three disciplines in our department has a student club and you should join! The Roanoke College Student Chapter of the Mathematical Association of America (or "Math Club" for short) meetings every other week, plays and learns about games and hosts evening events and the annual Pi-Day celebration! In addition, our department offers MCSP Tea every week on Thursdays from 2:15-3:15pm; come by Trexler 271 to talk to and meet other students as well as chat with the MCSP faculty members in a casual setting!

Attendance: Attendance is critical to the understanding of the material in the course; it is both required and expected. Absence from class has no effect on due dates and missed work may not be made up.

Late Work: Unless specific permission is given in advance, no late work will be accepted.

Academic Integrity: Students are expected to follow the integrity policy detailed in the handbook *Academic Integrity at Roanoke College*. All work that a student submits for a grade must be **solely** the work of that student unless the instructor has given explicit permission for students to work together.

Grading Components

Testing: As described in more detail on the next page, we will be making use of mastery-based testing.

Problems of the Day: At the end of each class period during which content is discussed, practice problems will be assigned. It is expected that students work all these problems. To keep you from procrastinating and to measure understanding, an overwhelming majority of class days will begin with a “problem of the day”. When you enter the classroom there will be a problem displayed for you to work and turn in. This problem will be due at 1:16pm regardless of when you enter the classroom.

Grading: Components of a student’s grade will be weighted as follows:

Mastery: 85%

Problem of the Day: 15%

Grading Scale: A grade scale will be determined after final averages are computed but will be no lower than the scale given below.

0	60	63	67	70	73	77	80	83	87	90	93
F	D-	D	D+	C-	C	C+	B-	B	B+	A-	A

Co-Curricular Engagement: The MCSP Department offers a series of talks (MCSP Conversation Series) that appeal to a broad range of interests related to your fields of study. You are invited to be involved with all these meetings. After attending, submit a one-page paper reflecting on the discussion through Inquire. These reflection papers earn **extra credit**, with .5% add to your course average for each attended, up to 2% total. In addition, individually you may request that other appropriate events can count.

Time Commitment: This course expects you to spend at least 12 hours of work each week inside and outside of class.

We will be making use of **mastery-based testing** rather than a points-based system. Mastery-based testing is very different from what you are used to – do not hesitate to ask me questions.

Description: You only receive credit for answers that demonstrate you completely understand (have mastered) a topic. But, you get many chances to display mastery throughout the semester with no penalty whatsoever for earlier attempts.

- The course has been boiled down to 18 essential types of questions, or “topics”.
- Your mastery of questions on these topics is assessed through the working of problem each Friday and during the scheduled final exam period.
- Each problem submitted is graded as either “Mastery” or “Not Mastered”. A grade of Mastery indicates that you have demonstrated full understanding of the concept being tested and further work on the topic is not necessary.
- Once you have mastered a problem you need not ever attempt it again.
- There is no penalty whatsoever for multiple attempts taken to achieve mastery.
- Mastery does not mean perfect, it means you understand and can demonstrate all fundamentals of the topic and are proficient at the level desired for the course – you do not need to study the topic further.

Your overall test grade is then determined by the number of topics you have mastered.

#Mastered	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Exam Grade	100	96	92	88	84	80	76	72	68	64	60	56	52	48	44	40	36	32

Notes on Master-Based Testing (in no specific order)

- Clear content objectives, students continually know exactly what they need to work on to improve.
- Credit only for eventual mastery. No partial credit. Multiple attempts with complete forgiveness.
- A points-based system sets arbitrary deadlines by which time perfection must be attained.
- Perseverance: Points – try a problem once, maybe twice, hope for the best.
Mastery – Keep trying until you succeed (and I know you can)
- Use of feedback: Points – do I agree with the instructors grading
Mastery – what can I do to demonstrate that I understand the concept
- Reduced Test Anxiety: Points – every test has the potential to damage your GPA.
Mastery – no one test can harm your grade.
- Intelligent Test Preparation: You may choose to skip problems on a test. Better to achieve mastery on some than to demonstrate mediocrity on all.
- A “broad and superficial” strategy may earn a C or D in a points-based system, in mastery you will fail.

Course Schedule

Mon	Jan 13	Topic 1	1.1-1.2	Intro
Wed		Topic 1	1.4	The Language of Graphs
Fri		Topic 2	2.1	Logical Forms and Equivalence
Mon	Jan 20	Topic 3	2.2	Conditional Statements
Wed		Topic 4	2.3	Valid and Invalid Arguments
Fri		Topic 5	3.1	Predicates and Quantified Statements I
Mon	Jan 27	Topic 5	3.2	Predicates and Quantified Statements II
Wed		Topic 6	3.3	Multiple Quantifiers
Fri		Mastery Day		
Mon	Feb 3	Topic 6	3.4	Arguments with Quantified Statements
Wed		Topic 7	4.1	Direct Proof and Counterexample I
Fri		Topic 7	4.2	Direct Proof and Counterexample II
Mon	Feb 10	Topic 8	4.3	Direct Proof: Rational Numbers
Wed		Topic 9	4.4	Direct Proof: Divisibility
Fri		Mastery Day		
Mon	Feb 17	Topic 9	4.5	Direct Proof: Division into Cases
Wed		Topic 10	4.7	Indirect Proof: Contradiction and Contraposition
Fri		No class meeting		
Mon	Feb 24	Topic 11	4.9	The Handshake Theorem
Wed		Topic 11	4.9	The Handshake Theorem
Fri		Mastery Day		
Spring Break				
Mon	Mar 9		5.1	Sequences
Wed		Topic 12	5.2	Mathematical Induction I
Fri		Topic 12	5.2	Mathematical Induction I
Mon	Mar 16	Topic 12	5.3	Mathematical Induction II
Wed		Topic 13	5.4	Strong Mathematical Induction
Fri		Mastery Day		
Mon	Mar 23	Topic 14	6.1	Set Theory
Wed		Topic 14	6.2	Set Properties
Fri		Topic 15	6.3	Set Proofs and Disproofs
Mon	Mar 30	Topic 15	6.3	Set Proofs and Disproofs
Wed		Topic 16	7.1	Functions
Fri		Mastery Day		
Mon	Apr 6	Topic 16	7.2	One-to-One and Onto
Wed		Topic 17	10.1	Paths, Trails, and Circuits
Fri		Good Friday – No Classes		
Mon	Apr 13	Topic 18	10.4	Trees
Wed		Topic 18	10.4	Trees
Fri		Mastery Day		
Mon	Apr 20	Course Wrap-up		
Wed	Apr 27	Mastery Day (Final Exam Period 2-5pm)		

Mastery Checklist

Mastered	Topic	Section	Content	attempt	1	2	3	4	5
<input type="checkbox"/>	Topic 1	1.1-1.2, 1.4	Intro						
<input type="checkbox"/>	Topic 2	2.1	Logical Forms and Equivalence						

