

Instructor: Dr. Chris Lee Trexler 270D clee@roanoke.edu (540) 375-2347

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 Materials: Textbook: Discrete Mathematics; Epp, Brief Edition. All work should be legible and done in pencil.

Attendance: Attendance is critical to the understanding of the material in the course; it is both required and expected. Any absence that is not discussed with the instructor prior to the missed class is considered unexcused. I will assume that if you accumulate 3 unexcused absences you are not interested in completing the course and will drop you from the class (DF). When absent, excused or unexcused, you are responsible for all material covered in class. You will not be allowed to make up any work missed due to an unexcused absence.

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

Cell Phones: This is very simple - no cell phones are allowed to be used or even visible in our classroom. This includes before, during, and after class. If a cell phone is seen, the student may be asked to leave the classroom and the day will be counted as an unexcused absence.

Computers: Unless it is at the direction of the instructor, laptops with keyboards may not be used during class. Tablets with inking capability may be used for note-taking.

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!

Reading and Participation: The key to learning a topic in mathematics is participation. We will strive to have an active, rather than passive, classroom environment. The last page of the syllabus is a day-by-day outline of the sections that will be discussed in class. You are fully expected to have read the upcoming section before the class meeting! This does not mean you need to understand everything, but rather you should be familiar with the definitions and concepts from the sections; having read the section will allow you to ask better questions and follow along better in 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 16 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	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Exam Grade	100	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25

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 (improvement!)
- 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.
- No longer will any of us have to wonder just what exactly a 7/10 means on a problem compared to an 8/10...
- 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 14		1.1-1.2	Intro
Wed		Topic 1	2.1	Logical Forms and Equivalence
Fri		Topic 2	2.2	Conditional Statements
Mon	Jan 21	Topic 3	2.3	Valid and Invalid Arguments
Wed		Topic 4	3.1	Predicates and Quantified Statements I
Fri		Topic 4	3.2	Predicates and Quantified Statements II
Mon	Jan 28	Topic 5	3.3	Multiple Quantifiers
Wed		Topic 5	3.4	Arguments with Quantified Statements
Fri		Mastery Day		
Mon	Feb 4	Topic 6	4.1	Direct Proof and Counterexample
Wed		Topic 6	4.1	Direct Proof and Counterexample
Fri		Topic 6	4.2	Direct Proof: Rational Numbers
Mon	Feb 11	Topic 7	4.3	Direct Proof: Divisibility
Wed		Mastery Day		
Fri		Topic 7	4.4	Direct Proof: Division in to Cases
Mon	Feb 18	Topic 8	4.5	Indirect Proof
Wed		Topic 8	4.5	Indirect Proof
Fri		Topic 9	5.1	Sequences
Mon	Feb 25	Mastery Day		
Wed		Topic 9	5.2	Mathematical Induction I
Fri		Topic 9	5.2	Mathematical Induction I
Spring Break				
Mon	Mar 11	Topic 10	5.3	Mathematical Induction II
Wed		Topic 11	5.5	Defining Sequences Recursively
Fri		Mastery Day		
Mon	Mar 18	Topic 11	5.6	Solving Recurrence Relations
Wed		Topic 11	5.6	Solving Recurrence Relations
Fri		Topic 12	6.1	Set Theory
Mon	Mar 25	Topic 12	6.2	Set Properties
Wed		Mastery Day		
Fri		Topic 13	6.3	Set Proofs and Disproofs
Mon	Apr 1	Topic 13	6.3	Set Proofs and Disproofs
Wed		Topic 14	7.1	Functions
Fri		Topic 14	7.2	One-to-One and Onto
Mon	Apr 8	Mastery Day		
Wed		Topic 15	10.1	Graphs: Definitions
Fri		Topic 15	10.2	Paths, Trails, and Circuits
Mon	Apr 15	Topic 16	10.3	Trees
Wed		Mastery Day		
Good Friday – No Class				
Mon	Apr 22	Course Wrap-up		
Wed	Apr 29	2-5pm Mastery - Final Exam Block		