

**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>

---

**Intended Learning Outcomes:** This course is designed to have students summarize and extend the mathematical knowledge obtained at Roanoke College. Given a problem of interest with mathematical content, students will identify the mathematical options available, and be able to explain the mathematics used in non-technical terms. Students should also be able to articulate what modern mathematics is, how it relates to classical mathematics, what roles theoretical and applied mathematics play, and how technology is utilized. By the end of this course, successful students will be able to understand and appreciate the interplay between applied mathematics and theoretical mathematics, state important results from the required classes in the mathematics major, form connections between the required classes in the mathematics major, and explain mathematics and mathematical concepts both orally and in writing,

**Required Materials:** Textbook: *None*. All work should be legible and done in pencil.

**Attendance:** Perfect attendance is expected and is the best strategy for success in this course; if you have a valid excuse for missing class, it must be discussed with me prior to that class. If an absence is required, you are responsible for the material covered in that class. Any absence that is not discussed with me prior to the missed class is considered unexcused. If you accumulate 3 unexcused absences, you will be dropped from the class with a grade of DF (dropped-failing) recorded. You, your advisor, and the registrar will receive a warning email at your second 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) meets 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!

**MCSP Conversation Series:** As you already know from spending a few years here, the MCSP Department offers a series of discussions that appeal to a broad range of interests related to these fields of study. These are known as the talks and lectures in the MCSP Conversation Series. You are invited to be involved with all talks; however, participation **at least three** of these sessions is mandatory. After attending, submit a one-page paper reflecting on the discussion. This should not be a regurgitation of the content, but rather a personal contemplation of the experience. These reaction papers will be submitted through Inquire; your final grade will be reduced by 2% for each paper not submitted.

**Academic Integrity:** Students are expected to adhere to the Academic Integrity policies of Roanoke College. All work submitted for a grade is to be your own work! No electronic devices other than calculators can be taken out during any class.

**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														

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

---

### Grading Components

**Course Grades:** The following table lists the weights for the various forms of assessment for this class.

Math Major Content Presentation	10%
Why Math Major? Presentation	10%
General Presentation	10%
Research Summary Paper	10%
Background Presentation	10%
Final Presentation	25%
Final Paper	25%

**Class Format:** Details on specific elements of this class are below, the focus on this class will be exploring the mathematics major and learning to link applied mathematics and theoretical mathematics. Since this is a seminar, the course will feel quite different from those you have taken in the mathematics major so far. The first part of this course will involve a trip through the mathematics major as you will present to each other the main ideas and thoughts from each of the classes involved in the mathematics major and Roanoke College while the remainder will focus on developing your oral and written communication in mathematics.

### Components of the Course

**Major Review:** The first part of this class will involve giving a presentation to the class regarding one piece of our review of the mathematics major at Roanoke College; in teams of two, you will review your chosen topic and present to the class the main concepts and ideas from that topic. Note that you should focus on the "big ideas" from the topics and the relationship of your topic to other courses in the major. For example, when talking about Linear Algebra, it is less important to spend time on *how* to row-reduce matrices rather than *why* you would row-reduce matrices and what that can tell you about a system of equations. This presentation will be graded partly by audience feedback and partly by the instructor and possible guests. You should target a length of about 40 minutes.

Note that this is excellent preparation for the Inquisition which is an oral review of the mathematics major, done individually, in front of the mathematics faculty in April. The primary goal of the Inquisition is

for the faculty to assess the mathematics program as a whole; participation in the Inquisition is required and failure to participate will result in a course grade of F.

**Why Math Major:** The second presentation for this class will be a short presentation, again in teams of two, different from the first presentation, on why one should choose to major in mathematics. The target audience for this presentation is Roanoke College freshmen and it will again be graded by the instructor and audience feedback.

**General Presentation:** One of the major goals of Math Seminar is to further develop your oral presentation skills related to mathematics. Again working in pairs, the third presentation of this class will be a presentation on any topic you wish; a good starting place to find a topic will be the Martin Gardner archive of problems and solutions, which will be provided, if needed. This presentation is designed to take about 20 minutes and will be graded again by a mix of audience and instructor feedback. Note that while general presentation skills will be assessed, a major focus of the talk is clarity in the exposition of the mathematics.

**Final Research Project:** The 2015 CUPM (Committee for Undergraduate Programs in Mathematics) of the MAA (Mathematical Association of America) guidelines describe a national trend for what concepts and skills mathematics majors should have by the end of their undergraduate program. At Roanoke College, we feel that these guidelines are entirely appropriate and have done a great job of meeting the guidelines from the CUPM. In the 2015 edition, one cognitive recommendation is that “students should learn to link applications and theory” and while we do a good job on each of these individually, there is no class or series of classes that expressly has students link the two. One of the best times to have students link applications and theory is after students have had a lot of development in both, and that time is now.

Your major project this semester is very broadly defined. You will complete, individually or in pairs, a research project that links applied mathematics and theoretical mathematics. To start, you will reflect upon the courses you have taken and find a favorite topic from either an applied course or a theoretical course and then research and explore the opposite side of the same topic. The result will be a paper and presentation on the topic that you have chosen. To help you reach that point, several checkpoints are present in the class to keep you focused:

- Early in the semester you will submit a short list to the instructor with your favorite applications and theoretical results in mathematics, and why you have enjoyed those items.
- You will find research papers in mathematics journals regarding these items and type a short report on the papers that you find (at least two journal articles are required).
- At the end of March, you will give a Background Presentation on your project. The focus here is to make sure that you've learned the background material well-enough so that you can proceed forward. It also gives you a chance to practice your presentation skills related to your topic. Note that, at this point, the link between applications and theory should begin to take shape but may not be fully developed.
- In the middle of April, there will be a week where, instead of class, you will have an individual meeting with the instructor to discuss progress on your project; a first draft of your paper will be due shortly before this.
- Your final paper will be due at the time of the final exam time block for this class (Friday, April 26); the presentation itself will happen either Tuesday or Thursday of the last week of regularly scheduled classes. Due to the large size of the class, we will meet slightly before the start for those classes (12:30 PM instead of 1:10 PM) and you should plan to talk for 15-20 minutes, including questions.

**Course Schedule**

		Major Review	Why Major in Math?	Individual Presentation	Final Project	
Tue	Jan 15	Work Day				
Thu	Jan 17	Work Day				
Tue	Jan 22	Work Day				
Thu	Jan 24	No class				
Tue	Jan 29	Presentations: MATH 121 & MATH 122				
Thu	Jan 31	Presentations: MATH 131 & MATH 201				
Tue	Feb 5	Presentations: STAT 202	Discussion		Discussion	
Thu	Feb 7	Presentations: CPSC 120 & MATH 331				
Tue	Feb 12		Presentations		List of Favorite Applications and Theoretical Results Due	
Thu	Feb 14		Presentations			
Tue	Feb 19			Discussion		
Thu	Feb 21			Work Day	Research Papers Report Due	
Tue	Feb 26			Presentations		
Thu	Feb 28			Presentations		
<b>Spring Break</b>						
Tue	Mar 12				No class: Individual Meetings by Appt	
Thu	Mar 14				No class: Individual Meetings by Appt	
Tue	Mar 19				Work Day	
Thu	Mar 21				Background Presentations	
Tue	Mar 26				Background Presentations	
Thu	Mar 28	----- Inquisition Prep ----- -----				
Tue	Apr 2				Work Day	
Thu	Apr 4				No Class First Draft of Final Paper Due	
Tue	Apr 9	----- Inquisition ----- -----				
Thu	Apr 11	----- Inquisition ----- -----				
Tue	Apr 16				Presentations (Class Starts at 12:30)	
Thu	Apr 18				Presentations (Class Starts at 12:30)	
<b>Fri</b>	<b>Apr 26</b>				<b>2:00pm, Final Papers Due</b>	