MATH 491, Spring 2020: Mathematics Seminar

Instructor	Dr. Karin Saoub	*Phone:* (540) 375-2348
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Class Meetings

Tuesdays, Thursdays: 1:10 - 2:40 PM in Trexler 374

Expected Work Hours

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

Office Hours

By appointment only (see https://saoub.youcanbook.me), mainly during the times listed below.

Mondays, Wednesdays, Fridays	1:15 – 2:00 PM
Tuesdays, Thursdays	11:00 – 12:00 PM

Course Objectives

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.

Intended Learning Outcomes

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, item explain mathematics and mathematical concepts both orally and in writing.

Required Materials

All work on homework, quizzes, and tests should be typed or legible and done in pencil.

Prerequisites

Two of MATH-361, MATH-371, MATH-381 must be taken prior to taking this course.

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%

A grade scale will be determined after final grades are computed, but will be no worse than the scale given below. Attendance and class participation will be considered when determining marginal grades.

		B+	87-89	C+	77-79	D+	67-69		
A	94-100	B	83-86	C	73-76	D	63-66	F	0-59
A-	90-93	B-	80-82	C-	70-72	D-	60-62		

<mark>Academic Integrity</mark>	<mark>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 collaboration is allowed on quizzes or tests. Unless otherwise stated, you many work together on the homework, but should write up your solutions separately.</mark>
	<mark>Cell phones must be turned off prior to entering the classroom. Laptops may be used for note-taking during regular class sessions, if this seems useful to you, but you may not log on to the internet or to an email server unless specifically told to do so. The use of laptops and other electronic devices, except for a calculator, during an exam is strictly prohibited. This includes tablets, smart phones, and iPods. Any use of such devices during a quiz or exam will be considered a breach of academic integrity. Note that looking at or using your cell phone during a test or quiz is considered a violation of Academic Integrity regardless of your purpose or intent in doing so.</mark>
Attendance & Make-Up Work	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 4 unexcused absences you are not interested in completing the course. After the 3rd unexcused absence, you, your advisor, and the registrar will be warned that another absence will result in your removal 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.*
	Unless specific permission is given in advance of the due date, no late work will be accepted.
MCSP Conversation Series	The MCSP Department offers a series of discussions that appeal to a broad range of interests related to these fields of study. These co-curricular sessions engage the community to think about ongoing research, novel applications and other issues that face our discipline. Members of this class are invited be involved with all of these meetings; however participation in at least **three** of these sessions is mandatory.
	After attending, submit within one week of the presentation a one page paper reflecting on the discussion. This should not simply 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.
Study Room	The MCSP Study Room, Trexler 271, can be used by you and your friends to meet up so that you can work on homework together or prepare for tests. It is open virtually 24 hours a day, 7 days a week (very occasionally there are meetings in that room). Your student ID card should grant you access to Trexler Hall any time of day if the doors happen to be locked (use the card access point located by the first floor entrance facing the parking lot). Take advantage of this area and time, especially during weekdays when I am around (which is generally a lot)!
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! Membership in our Math Club also grants membership into the MAA itself; one of the premiere professional mathematical organizations in the world.

Accessible Education Services	AES is located in the Goode-Pasfield Center for Learning and Teaching in Fintel Library. AES provides reasonable accommodations to students with documented disabilities. To register for services, students must self-identify to AES, complete the registration process, and provide current documentation of a disability along with recommendations from the qualified specialist. Please contact Dr. Sue Brown, Director of Academic Services and Acting Coordinator of Accessible Education Services, at 540-375-2247 or by e-mail at sbrown@roanoke.edu to schedule an appointment. If you have registered with AES in the past and would like to receive academic accommodations for this semester, please contact Dr. Brown at your earliest convenience to schedule an appointment.

Course Components

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 around 50 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 Major in Math?	The second presentation for this class will be a short presentation (about 10 minutes) on why one should choose to major in mathematics. You may talk to each other to get ideas, but you will presenting these individually. 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. 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 is an individual presentation and is designed to take about 20-30 minutes. These 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

In addition, our department offers a weekly tea time for students and faculty; feel free to stop by the MCSP Study Lounge (Trexler 271) for tea and cookies on Thursdays from 2:15 PM to 3:15 PM. Come meet other students as well as chat with the MCSP faculty members in a casual setting!

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, 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).

- In mid–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.

- Twice in March, there will be a days 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 at the end of March.

- Your final paper will be due at the time of the final exam time block for this class (Friday, April 24); the presentation itself will happen either Tuesday or Thursday of the last week of regularly scheduled classes. You should plan to talk for 20-30 minutes, including allowing time for questions.

Tentative Course Schedule

	Date	Major Review	Why Major In Math?	Individual Presentation	Final Project
Tue	Jan 14	Introduction			
Thu	Jan 16	Presentation Math 121 & 122			
Tue	Jan 21	Presentation Math 131			
Thu	Jan 23	Presentation Math 201			
Tue	Jan 28	Presentation Stat 202			
Thu	Jan 30	Presentation Theoretical Courses			
Tue	Feb 4	Presentation Applied Courses	Discussion		Discussion
Thu	Feb 6	NO CLASS	Work Day		

Tue	Feb 11	NO CLASS			List of Favorite Applications & Theoretical Results due
Thu	Feb 13		Presentations	Discussion	
Tue	Feb 18			Work Day	
Thu	Feb 20			Discussion	
Tue	Feb 25			Presentations	Research Summary Report due
Thu	Feb 27			Presentations	
Spring Break					
Tue	Mar 10				In-class Work Day
Thu	Mar 12	NO CLASS			*Individual meetings*
Tue	Mar 17	NO CLASS			*Individual meetings*
Thu	Mar 19				Background Presentations
Tue	Mar 24				Background Presentations
Thu	Mar 26	NO CLASS			*Individual Meetings*
Tue	Mar 31				In-class Work Day First Draft of Final Paper due
Thu	Apr 2				Work Day
Tue	Apr 7		**—– Inquisition Prep —–**		
Thu	Apr 9		**—– Inquisition —–**		
Tue	Apr 14				Final Presentations
Thu	Apr 16				Final Presentations
Fri	Apr 24		**Final Paper due 2 PM**		