BOB JONES UNIVERSITY
Department of Mathematics

URMS ~ Undergraduate Research in the Mathematical Sciences

Fall 2025-26

Ma 399 Introduction to Research & Ma 497/498 Research in Mathematics
& Ma 499 Mathematics Research Capstone

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URMS Meetings:	Th 12:00-1:15p.m. (AL 300)	
Research Meetings:	as scheduled by Research Advisor	

Textbooks and Technology

- *Mathematics Through the Eyes of Faith* by Russell Howell and James Bradley, HarperCollins/HarperOne, 2011. (cost: ~ $20)
- *Handbook of Writing for the Mathematical Sciences* by Nicholas J. Higham, 3e, SIAM, 2020. (cost: ~ $45)
- *TEXStudio* and *MikTEX* installed on your personal computer (cost: free)
- Other requirements to support research should be discussed with the research advisor.

Course Descriptions

- **Ma 399 Introduction to Research:** Required of all students majoring in mathematics. Allows students the opportunity for a thorough development of their philosophy of mathematics, exposes them to a variety of mathematical research, and addresses career and graduate school preparedness. (1 credit)
- **Ma 497 Research in Mathematics 1:** A theoretical or applied research project chosen in consultation with a faculty mentor and culminating in a paper and oral presentation. (3 credits)
- **Ma 498 Research in Mathematics 2:** A continuation of research started in Ma 497. (3 credits)
- **Ma 499 Mathematics Research Capstone – EXP:** Required of all students majoring in Mathematics. An independent study of an advanced mathematical topic resulting in a written and oral presentation. Not applicable toward a minor. (1 credit)

Course Context

URMS is a sequence of courses designed to engage upper-level mathematics majors in mathematical scholarship beyond the classroom and prepare them for more advanced work in graduate school, industry, or academia. Students will be introduced to the world of mathematics colloquia and conferences and be encouraged to find opportunities to network with mathematicians. Over the course of three (or four) semesters, students will

conduct mathematical research, formulate a philosophy of mathematics, and hone skills in communication, critical analysis, and collegiality. The sequence of URMS courses is designed to function as a whole: Ma 399 introduces mathematical research, philosophy, and community; Ma 497/498 offers the time and support necessary for the development of these three components; and Ma 499 wraps up the process with finishing touches on research and philosophy culminating in capstone papers and presentations.

Experiential Learning Context: While the entire URMS course sequence is part of the experiential learning process, Ma 499 has been approved for EXP (Bruins Engage!) credit and addresses each of the five criteria for experiential learning: engagement, mentorship, challenge, ownership, reflection. To receive EXP credit students must (1) complete the EXP Exit Survey, (2) earn at least 28 points out of 40 on the EXP summative reflection (i.e., Experiential Reflection), and (3) earn no less than a C- in the course.

These courses support all objectives of the Division of Mathematical Sciences (as listed in the BJU Course Catalog) as well as the following learning outcomes of the mathematics program:

MM1: Progress logically from premises to valid conclusions in a variety of mathematical contexts.

MM4: Construct a biblically consistent philosophy of mathematics.

Course Goals

The student will . . .

CG1: Develop mathematical maturity and independent thinking.

CG2: Learn to read mathematical literature (both primary and secondary sources).

CG3: Learn to evaluate mathematical works to determine their value and application.

CG4: Improve the ability to communicate mathematical ideas in formal and informal settings both orally and in writing.

CG5: Acquire career competencies and artifacts for use in transitioning to graduate school or a career.

CG6: Develop a biblically consistent philosophy of mathematics.

Course Objectives

By the culmination of the sequence of URMS courses, the student will be able to . . .

1. Independently learn an advanced mathematical topic.
   - assessed through discussion during meetings and by written and oral reports
2. Communicate knowledge and methods in an informal setting to a group of peers.
   -assessed through discussion during URMS meetings
3. Present research methods and results at a conference/symposium or to a client.
   - assessed by oral or poster presentation
4. Present a technical report of mathematical methods or theory using appropriate mathematical language and formatting.
   - assessed by written report
5. Articulate their philosophy of mathematics.
   - assessed through discussion during URMS meetings and by written report
6. **EXP Distinctive:** The student will be able to describe and reflect critically over what has been learned, showing how faith integrates with learning and how learning will inform future personal and professional practices.
   - assessed through the Experiential Reflection paper.

Course Requirements

Activities in the URMS sequence are designed to build the student's ability in mathematics research, the philosophy of mathematics, and various other professional skills. All activities in Research and Philosophy build toward two capstone projects delivered in Ma 499:

- Mathematics Research Capstone Paper and Presentation, and
- Philosophy and Worldview of Mathematics Paper.

The professional development activities either directly support research or broaden the student's knowledge of career paths and other opportunities in mathematics.

Major Assignments Schedule: Research Papers and Presentations are due near midterm and at the end of each semester. Philosophy Papers are due in the third-quarter of the first and final semesters. (See Canvas or the Course Guide for specific deadlines by course.)

Grading Scheme: The grade distribution for the three subject areas (research, philosophy, and professional development) differs among the URMS courses depending on the emphases of each course. Table 1 lists assessments and their relative values for the various URMS courses.

EXP Requirements

This course has been approved for EXP (Bruins Engage!) credit and addresses each of the five criteria for experiential learning: engagement, mentorship, challenge, ownership, reflection. To receive EXP and course credit students must satisfactorily complete all EXP course elements within the required timeframe, including:

- Exit Survey
- C- (28 points out of 40) or higher on the summative reflection questions
  - EXP Summative Reflection – approximately 150-word minimum for each of the four elements.
  - Students may revise their summative reflection one time to meet the C- standard.
- Failure to complete any of the above will result in *an F for the course*.

Note that students cannot pass the class unless they complete the required EXP elements, regardless of their grade in the rest of the class.

Course Evaluation

All course/assignment grades are based on the evaluation of the work communicated by the student. Unclear or incomplete communication of the solutions, which includes the process, may result in a penalty at the professor's discretion.

Letter grades will be based on a standard 10-point scale

Office Hours

Office appointments can be made using the Calendly site (appointments may be made up to two weeks in advance), `https://calendly.com/llcarpen`. If there are no available times at which you are able to meet, send your professor a message including some days/times between 7:30am and 3pm when you are available.

General Policies

Table 1: Course Grading Scheme

	Assessment Type	Ma 399		Ma 497/498		Ma 499	
Research							
Confidentiality and Ethics	training	yes	–5%	renew	–5%	renew	–5%
Research Journal	written – informal	begin	8%	cont	8%	cont	–5%
Time Invested		2% to –2%		2% to –2%		2% to –2%	
Research Meeting Behaviors	oral – informal	- -		yes	8%	yes	8%
Lit Review & Annotated Bib	written – mixed	begin	20%	cont*		cont*	
Research Proposal/Charter	written – formal	prop	20%	renew	–5%	renew	–5%
Research Papers							
formative (Intermediate Results)	written – formal	- -		periodic	8%	periodic	8%
summative	written – formal	- -		term	40%	capstone	45%
Presentations							
formative (Proposal)	oral – formal	proposal	10%	- -		- -	
formative (Intermediate Results)	oral – mixed	- -		periodic	4%	periodic	4%
summative	oral – formal	- -		term	15%	capstone	18%
Research Activities Weight			**60%**		**85%**		**85%**
Professional Development							
LaTeX & Beamer	written	begin*		cont*		cont*	
Career/Graduate-School Survey							
presentation	oral – formal	yes	15%	- -		- -	
Resumé	written – formal	yes	–5%	update**		update**	
Colloquia/Conference Reflections	written – informal	yes	–5%	yes	–5%	yes	–5%
Experiential Reflection	written – formal	- -		yes	5%	revise	–50%
EXP Exit Survey	online survey	- -		- -		yes	–50%
Prof Dev Activities Weight			**15%**		**5%**		**0%**
Philosophy							
Philosophy Reading Reflections	written – informal	yes	5%	yes	5%	optional**	
discussions	oral – informal	yes	5%	yes	5%	yes*	
Philosophy Papers	written – formal	term	15%	- -		capstone	15%
Philosophy Activities Weight			**25%**		**10%**		**15%**

Point assignments are subject to change.

Notes: *Graded as part of other assignments. **Not graded. ***Negative percentages show possible penalty.

EXP Distinctive: Ma 499 requires successful completion of the Experiential Reflection and the EXP Exit Survey.

Deportment

Compliance with student handbook policies is expected during class. The classroom is to be a professional environment. That means you are to come to class prepared for the day's discussion, your attention is expected to be on course related material, and you are expected to positively contribute to the class.

Emergencies During Class

In case of emergency requiring evacuation, students will go down the stairs on the fountain side and exit the door facing Wade Hampton underneath the stairs. Students will immediately cross the street and gather by the fence with their class. If we are unable to exit the building, the professor will instruct the students on the best course

of action. To be able to respond quickly to external threats, professors may keep classroom doors locked. If you are late arriving to class, you may need to knock on the door and be let in.

Absences

BJU attendance policy is in effect (see `https://home.bju.edu/bju-policies/` for details).

- Scheduled tests/quizzes should be taken before your planned absence; please contact your professor to make arrangements for doing so. You are personally responsible for getting notes from your classmates and discussing the missed material with them. You should not expect your professor to privately re-teach you the material you missed. Your professor is always available to help you with specific questions. If an unannounced quiz/assessment is taken during the class that you miss, you will NOT be allowed to make it up, and you WILL receive a zero on the assignment. Work may always be completed early (see your professor if you wish to take a test early).
- Missing an in-class test because you feel you are not prepared to take it is not acceptable. Work missed for this reason will not be made up and you will receive a zero on the assignment.
- For absences due to incapacitating illness or emergency, you should contact the instructor as soon as you realize you will not be in class to make arrangements to make up any missed work. Tests will be made up without penalty for the first occurrence. Each subsequent time a test is missed because of incapacitating illness or emergency, an additional 10% grade penalty for that test will be incurred. A 10% penalty will be assessed for a late submission of take-home tests. All late work must be made up by the next class period unless other arrangements have been made with the professor.

Presentation of Work

The goal is professional, fluent, and clear communication of what you know.

PW 1: Proper use of mathematical notation is expected. The structure of notation conveys specific meaning and should be used appropriately.

PW 2: Mathematical presentation is like grammar. There are subjects, verbs ($=, \leq, >$, etc.), and objects. Always write in "complete sentences."

PW 3: Tests/presentations/projects are not about what you know, but about what you can communicate about what you know – so the presentation of your work/logic should always be neat, orderly, clearly defined, and with the appropriate amount of supporting detail. (Excessive steps are not required; however, answers alone are not (usually) acceptable.)

PW 4: Always work down the page. (Working in multiple columns is generally not acceptable.) There should be one problem worked in each "row" because this contributes to clarity and the development of your logical argument.

PW 5: Skip lines between problems. If you have dense handwriting, skip every other line and skip 2-3 lines between problems.

PW 6: Clearly label problems/sub-problems. Problems do not necessarily have to be worked in order but must be clearly labeled either way. Your professor will communicate their expectation on presenting problems out of order.

PW 7: Answers are to be presented as the logical conclusion of your work, not as the only important thing (e.g. at the start of the problem and/or unconnected with any justifying work).

PW 8: Work should be submitted on clean 8.5×11 inch (standard-size) paper and should not be submitted with "spiral"/ripped edges.

PW 9: Take-home tests (when time is not limited) should be neatly presented (rewritten, organized, no scratchwork, etc.) as a final polished piece.

Your professor may refuse to accept work that does not meet the minimum presentation requirements above, or they may choose to deduct up to 10% from the assignment.

Problems Expectations

The goal is to prove your mastery (not your just barely comprehending).

PE 1: Read all words carefully in a question. Everything is important, so know what the meanings of all words are and how those words tell you to respond.

PE 2: Theory is a precise expression of important ideas. While it is not graded word for word, jot for jot, the precise ideas must be maintained. Embrace thorough, smooth learning and presentation. Can you recite the theory from the last class period quickly, comfortably, and conversationally?

PE 3: Theory tells us how to solve problems. Know exactly what problems connected to each theorem or definition look like, and know how to solve them.

PE 4: Know what the key steps of each problem are. Present only the key steps (or the minimum needed to get the answer right and show all your logic).

PE 5: Do enough practice for each type of problem so that you are smooth.

Failure to meet these expectations will be reflected in lower test scores.

Late Policy

Assignments not submitted as directed by the due date will incur the following late penalty.

- No late homework/in-class assignments are accepted.
- Written assignments/projects/take-home tests are penalized at 15% if submitted within 3 calendar days of the due date and are a 0 after that. Oral presentations are a 0% if not presented on the day assigned.

  Late paper submissions must include the date and time the paper is submitted and be in the credenza by 8am the next day. The next day penalty begins at 8am.
- In-class tests must be taken by the date given in class (or selected time in the case of an oral exam) unless there is incapacitating illness (see attendance policy below). Missing a test/taking the test late (including an oral exam) will result in a 10% penalty unless excused by the professor. Tests should be made up prior to the next class period unless other arrangements have been made with the professor.
- Work may always be completed early (contact your professor if you wish to take a test early).

Note: Assignments with penalty grading only will hold a penalty of 1% of the course grade if submitted within 3 calendar days of the due date and at 5% of the course grade thereafter.

Academic Integrity Policies

The university's Academic Integrity Policy is in effect (see `https://home.bju.edu/bju-policies/` for additional details).

Definitions of Integrity Violations

Integrity is the reflection of the character and nature of God in our actions; therefore, students will be expected to work with integrity. In academia, violations of integrity generally fall into one or more of the following categories:

- Cheating: unauthorized use or attempted use of assistance, information, or aids in any academic assignment
- Falsification: submitting work done by others, changing work after submitting an assignment, reporting false information about the completion of an assignment
- Unacceptable collaboration: working with others when not permitted, using AI to generate ideas, thoughts, or content without the explicit permission of the professor
- Facilitation of Cheating: helping another student violate academic integrity, communicating quiz/test questions to other students
- Plagiarism: the intentional or unintentional use to any degree of the ideas or words of one's source material without proper acknowledgement

All work done for this class must represent your own effort, your own understanding, and your own communication of the material.

Course Integrity Policies

If information is taken from other sources (which is at times appropriate), it always needs to be referenced and credit given where it is due. Use standard referencing techniques as taught in En 102. Solutions found on the internet are not to be copied.

- Homework: While you are encouraged to work together on the homework assignments, simply copying someone else's solution is neither useful nor acceptable. Your homework should represent your work and your understanding of the work.
- Tests (In-Class and Take-Home): No resources may be used while taking the test unless permitted by the professor. The presence of any unauthorized material on your desk, in your calculator, on your laptop, etc. while taking a test will be construed as cheating and will be dealt with as such.

  Internet/AI enabled devices or any communication devices (including but not limited to smart glasses, watches, earbuds, etc.) are not permitted to be used and should be stored out of sight during the testing period. Access these type of devices during the test will be construed as cheating and will be dealt with as such.

  Cheating on a test will likely result in a zero on the test and will be submitted to the Academic Integrity Committee.
- Projects: You are encouraged to discuss the general ideas needed to complete the project as discussed in this course with your classmates but are not permitted to "work together" on your project (outside of your own team and any faculty appointed advisors). Your projects must represent your own ideas, your own work, and your own communication of your work.

Assignment submissions will be evaluated for plagiarism and AI usage at the discretion of the professor. If you have a question about any source you are considering using, it is wise to gain your professor's approval before using it. You are always permitted to ask your professor for help. Any help they choose to provide is acceptable.

AI Usage Policy

The goal of the assignments in this course is to learn to develop the skills covered, NOT to complete the tasks assigned. The use of AI to complete or jumpstart tasks defeats the goal of the assignments. Therefore, you may not use generative AI tools in this course for any assignment without the professor's express permission. AI tools include, but are not limited to, CoPilot, Apple Intelligence, Chat GPT, Bing Chat, Google Bard, Grok, Deepseek, Grammarly, and language translators.

Use of generative AI to develop code (such as Python or R) may be helpful during the project (each student has permission to use AI for only this purpose, other purposes require express permission). It would be wise to consult with your professor before incorporating it into your work. Reliance on AI to generate code has not yet resulted in an acceptable paper. If you do use it, you must document it as indicated above. You may NOT use AI to generate the text/discussion in your project.

Documentation of Permitted AI Use

Should an AI tool be used with permission, its use must be documented (including the tool used, a summary of the prompts provided and the portions of the assignment that were based on AI generated work). See `https://style.mla.org/citing-generative-ai/` for details on citing the use of AI.