BOB JONES UNIVERSITY
Department of Mathematics

URMS ~ Undergraduate Research in the Mathematical Sciences

Both Semesters 2024-25

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. ISBN 9780062024473 (cost: ~ $20)
- *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, Goals, and Rationale

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.

- **URMS Course Goals:** The student will . . .
  - Develop mathematical maturity and independent thinking.
  - Learn to read mathematical literature (both primary and secondary sources).
  - Learn to evaluate mathematical works to determine their value and application.
  - Improve the ability to communicate mathematical ideas in formal and informal settings both orally and in writing.
  - Acquire career competencies and artifacts for use in transitioning to graduate school or a career.
  - Develop a biblically consistent philosophy of mathematics.

  These URMS course goals 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:

- **Mathematics Program Learning Outcomes:** The student will . . .
  - Progress logically from premises to valid conclusions in a variety of mathematical contexts.
  - Construct a biblically consistent philosophy of mathematics.

Course Objectives

By the culmination of the sequence of URMS courses, the student will be able to:
(Note: The section on Course Requirements includes further detail by semester.)

- Independently learn an advanced mathematical topic.
  - assessed through discussion during meetings and by written and oral reports
- Communicate knowledge and methods in an informal setting to a group of peers.
  -assessed through discussion during URMS meetings
- Present research methods and results at a conference/symposium or to a client.
  - assessed by oral or poster presentation
- Present a technical report of mathematical methods or theory using appropriate mathematical language and formatting.
  - assessed by written report
- Articulate their philosophy of mathematics.
  - assessed through discussion during URMS meetings and by written report
- **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 and Evaluation

- **Attendance and Participation** All URMS students are to attend . . .
  - At least three (preferably four) mathematics colloquia or conferences each semester including any visiting lecturer colloquia hosted by the BJU department of mathematics.
    - assessment through written reflection and URMS discussion
  - All URMS mini-conference talks (typically on the final Tuesday of the semester).
    - absences negatively impact course grade up to half a letter grade
  - Weekly URMS group meetings (typically at the regularly scheduled class time unless otherwise announced).
    - absence counts as course absence
  - Weekly research meetings (TBD by research advisor). Applicable only to 400-level URMS students.
    - missed meeting counts as course absence

- **Activities and Assessments** 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 a two capstone papers presented 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. See Table 1 for a list of activities and assignments by semester.

Table 1: Course Grading Scheme

	Assessment Type	**Ma 399**		**Ma 497/498**		**Ma 499**	
Professional Development							
Research Confidentiality and Ethics	training	yes	–5%	renew	–5%	renew	–5%
LaTeX & Beamer	written	begin*		cont*		cont*	
Career/Graduate-School Survey	written – formal	yes	10%	- -		- -	
presentation	oral – formal	yes	5%	- -		- -	
Resumé	written – formal	yes	–5%	update**		update**	
Colloquia/Conference Reflections	written – informal	yes	–5%	yes	–5%	yes	–5%
Grant or Conference Proposal	written – formal	- -		optional**		yes	–5%
Experiential Reflection	written – formal	yes	5%	yes	5%	revise	–50%
EXP Exit Survey	online survey	- -		- -		yes	–50%
Prof Dev Activities Weight			**20%**		**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%**
Research							
Research Journal	written – informal	begin	10%	cont	10%	cont	–5%
Lit Review & Annotated Bib	written – mixed	begin	20%	cont*		cont*	
Research Proposal/Charter	written – formal	prop	15%	renew	–5%	renew	–5%
Research Papers							
formative (Intermediate Results)	written – formal	- -		periodic	10%	periodic	10%
summative	written – formal	- -		term	40%	capstone	45%
Research Presentations							
formative (Intermediate Results)	oral – mixed	- -		periodic	10%	periodic	10%
formative	oral – formal	topic	10%	- -		midterm*	
summative	oral – formal	- -		term	20%	capstone	20%
Research Activities Weight			**55%**		**85%**		**85%**

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.

- **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 also shows relative values of the various assessments in the URMS courses.
- **Grading Scale:** Standard 10-point scale.

General Policies

- **Deportment:** All meetings are to be conducted in a professional manner. That means, while in attendance students are expected to focus on course/research related material and to contribute positively to the meeting. Professors reserve the right to ask a student to leave a meeting should their attention be elsewhere (sleeping, surfing the internet, working on assignments for another class, etc.).

  Professionalism includes the attitudes being conveyed. Respect is to be shown towards all in attendance. Discourse should be gracious. Critique and inquiry is to be collegial – given and received with humility, fairness, and an open-mind.

- **Attendance:** Missed URMS and research meetings will be counted as course absences. Arriving late or leaving early from a meeting will count as a partial absence. The University's attendance policy is in effect for URMS and research meetings. Further explanation of URMS attendance policy's can be found in the Meetings section of the URMS Course Guide.
- **Missing Work:**
  - **Written Assignments:** Written assignments (both electronic and print) will be penalized 10% per day if turned in within three calendar days following the due date and will receive a 0 thereafter.
  - **Oral Assignments:** Oral assignments will receive a 0 if not presented on the day assigned without prior approval by the appropriate professor.
  - **Exceptions:** Exceptions may be granted by the URMS instructor or research advisor in emergencies. The student is responsible to contact the appropriate professor by Teams as soon as possible to notify them of the emergency.
- **Academic Integrity:** The University's academic integrity policy is in effect (see https://home.bju.edu/bju-policies/ for more details).
  - **Artificial Intelligence:** Because the goals of the assignments in this course are to develop skills and to conduct independent research rather than simply to complete tasks, and because the use of AI to complete or jumpstart tasks defeats the goal of these assignments, you may not use generative AI tools (i.e. Chat GPT, Bing Chat, Google Bard, etc.) in this course for any assignment without the professors' express permission. 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).
  - **Cheating and Plagiarism:** Cheating is defined as any use of unauthorized helps. Plagiarism is defined as taking someone else's words and/or ideas and claiming them as ones own. All work done for the URMS courses must be independent and original. If information is taken from other sources (which is at times appropriate), it must be adequately cited so credit is given to whom it is due. Use standard referencing techniques as taught in En 102.
  - **Originality:** Students are permitted (and encouraged) to discuss the ideas of their research but are not permitted to collaborate with anyone other than their research advisor on papers or presentations unless working on a collaborative research effort under the direction of the research advisor. In which case, the research advisor will determine which papers/presentations may be worked on and submitted jointly. Papers and presentations should represent the student's own ideas and their own work and should be the product of their own thinking and efforts. A student may not use AI to generate any portion of their papers or presentations without explicit permission from their professor (and if permission is granted it must be documented as described above).
  - **Ask Your Advisor:** If you have a question about any source you are considering using, please gain your research advisor's approval before using it. You are always permitted to ask your professor for help. Any help they choose to provide is acceptable.