

# Recreational Mathematics and Outreach

## MATH 2194

### Spring 2022

Tuesday & Thursday

11:10 am – 12:30 pm

Denney Hall

Recitation

3 contact hours per week

### Instructor Info

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**Overview:** This course is a hands-on approach to the study of mathematics and the practice of its communication and informal education. In this course, students will study mathematics through problems in recreational topics such as art, games, and puzzles. Course participants will design an engaging activity within those topics to present at a K-12 classroom with the goal of helping students realize how rich mathematics are and to overcome their anxiety with the subject.

### Course Goals

In successfully completing this course, students will:

- Student gain and apply academic knowledge through civic engagement with communities.
- Have confidence in their ability to explain mathematics.
- Understand how to break down advanced topics.
- Understand the importance of hands-on learning.
- Understand recreational math research as a discipline.
- Understand the importance of communicating math research to non-mathematical audiences and of extending teaching, learning, and research beyond the math departments.
- Develop personal and social responsibility through engaging with the local community.

### Materials

No required textbook. Course materials, reading assignments, homework, activities, etc. will be available on the course web site on Carmen.

### Assignments and Grading

We will use a “specifications based” grading scheme, which requires assignments to reach specific standards, related to the learning goals. Final course grades are then determined based on how many assignments meet these standards.

Graded using the Exceeding Specifications, Meeting Specifications, Approaching Specifications, and Beginning scale. Presentations and the Final Project will have 6-10 categories. Specific rubrics for each assignment will be made available throughout the course.

## Assignments

Over the semester, there will be a variety of assignments for you to turn in. These will each be graded based on a rubric and will be at most one page in length. The assignments and rubrics will be described in detail on the Carmen site.

Some examples of assignments include, but are not limited to:

- Intro quiz
- Service reflection
- Peer feedback of presentations
- Self-Assessment of Service Learning using the Service-Learning rubric

## In Class Practice Demonstrations

Students will choose a hands-on math activity from a catalog. They will study the activity and present it two times in class, with their classmates serving as the activity participants.

## Presentations with Community Partners

Each student will be required to attend one BAMB activity as an observer before participating in presentations with the community partners. This can be any BAMB activity, not necessarily with the community partners.

Students will lead their chosen hands-on math activities at elementary school classrooms. Before that, they must demonstrate their ability to lead the activity at the appropriate level for their audience. This will be done by means of the in-class practice demonstrations. Student must be prepared to explain instructions, give hints when participants are stuck, explain the math behind the activity, and address participant questions. Each student is required to participate in two presentations with the community partners, one in a lead role and one in a supporting role.

Presentations at schools will take place in late March, after spring break.

## Final Project: Design a hands-on math activity

The main project will be designing a new hands-on activity related to a recreational math topic. There will be time in class to work on project (three sessions). The project deliverables are:

- March 27: Topic selection
- April 17: Lesson plan draft
- April 21: Presentation
- May 3: Final lesson plan

As part of the final project, students will need to prepare a paper where they reflect upon the impact of the course on self and on the community. The paper is due May 3. It should be at least 2 pages and must touch on the following aspects:

- How the course changed your perspective of mathematics (or how it failed to do it)
- The activity creation process
- Hands on vs traditional (lecture based) mathematics learning
- How you think these outreach activities can aid K-12 students in learning math
- The importance of communicating math
- How are the concepts and skills that you have learned in an academic setting connected to your community-based work?
- Demonstrate your understanding of the issues, resources, assets, and cultures of the community in which you worked.
- Evaluate the impacts of the service-learning activity. Use concrete examples.

## Grading Criteria

Grade	Criteria
F	<ul style="list-style-type: none"> <li>Does not reach the level of D.</li> </ul>
D	<ul style="list-style-type: none"> <li>Does not actively participate in activities during class</li> <li>At least 60% of the in class and homework assignments completed at the Exceeding level described in the rubric, at least 10% at the Meeting Specifications level, and at least 10% at the Approaching Specifications level.</li> <li>In class presentations scores at least Approaching Specifications in all categories, with at least half of the rubric categories at Meeting Specifications level.</li> <li>Attends only one activity with community partner in a supporting role</li> <li>Final Project scores at least Approaching Specifications in all categories, with at least half of the rubric categories at Meeting Specifications level.</li> </ul>
C	<ul style="list-style-type: none"> <li>Demonstrates sporadic participation in class activities</li> <li>Completes all in class and homework assignments, with at least 60% completed at the Exceeding Specifications level, at least 10% at the Meeting Specifications level, and at least 10% at the Approaching Specifications level.</li> <li>In class presentations scores at least Approaching Specifications in all categories, with at least half of the rubric categories at Meeting Specifications level.</li> <li>Attends at least two activities</li> <li>Final Project scores at least Approaching Specifications in all categories, with at least half of the rubric categories at Meeting Specifications level.</li> </ul>
B	<ul style="list-style-type: none"> <li>Demonstrates a consistent and active participation in class activities</li> <li>Complete all in class and homework assignments, with at least 70% completed at the Exceeding level and at least 10% at the Meeting Specifications level.</li> <li>In class presentations scores at least Approaching Specifications in all categories, with at least half of the rubric categories at Exceeding level and only two categories scoring Approaching Specifications.</li> <li>Attends at least 2 activities, one in a presenting role</li> <li>Final Project scores at least Approaching Specifications in all categories, with at least half of the rubric categories at Exceeding level only two categories scoring Approaching Specifications.</li> </ul>
A	<ul style="list-style-type: none"> <li>Demonstrates a consistent and highly active participation in class activities</li> <li>Complete all in class and homework assignments, with at least 80% completed at the Exceeding level and at least 10% at the Meeting Specifications level.</li> <li>In class presentations scores at least Meeting Specifications in all categories, with at least half of the rubric categories at Exceeding level.</li> <li>Attends all three required activities</li> <li>Final Project scores at least Meeting Specifications in all categories, with at least half of the rubric categories at Exceeding level.</li> </ul>

## Tentative Course Schedule

The instructors reserve the right to modify the schedule as the course develops to better suit the needs of the class.

Date	Content	Activities	Assignment
Jan 11	<ul style="list-style-type: none"> <li>Intro writing assignment</li> <li>Short Outreach Activity</li> <li>What is Recreational Math? What is math outreach? What does BAMM do and why?</li> <li>Course Goals &amp; Syllabus</li> </ul>		Intro Writing Assignment
Jan 13	Outreach and popularization of mathematics	BAMM short activity Survey of math outreach initiatives	Choose one of the surveyed initiatives (including the BAMM activity presented). Answer reflection questionnaire about the effectiveness of it.
Jan 18	Number theory topics	Activity and discussion on the math content	Identify key concepts in the activity
Jan 20			Identify key concepts in the activity
Jan 25	Graph Theory	Activity and discussion on the math content	
Jan 27			Home: Pick an existing activity to present. Written report of questions you have about it.
Feb 1	Science Communication	Guest Speaker: Katherine O'Brien	Guest's assignment
Feb 3	<ul style="list-style-type: none"> <li>Informal teaching</li> <li>Cooperative learning</li> <li>Hands-on teaching</li> <li>Why visiting classrooms</li> </ul>	Reading and discussion	Q&A session about the chosen activity
Feb 8	Topology	Topic - Lecture/Paper	In-class: Come up with ideas on how to present this topic as a hands-on activity
Feb 10		Activity	
Feb 15	Combinatorics	Topic - Lecture/Paper	In-class: Come up with ideas on how to present this topic as a hands-on activity
Feb 17		Activity Reading: How students of different ages learn	Home: Identify the low floor, high ceiling aspects of the activity you will present, and how that activity would change with different age groups
Feb 22	Facilitator training	Based on JRMF trainings and their Engaging Children with Math seminars	In-class: Last minute questions about chosen activity
Feb 24	Cultural humility	Guest Speaker: Chao	Guest's assignment
Mar 1	Student presentations		Peer feedback
Mar 3			

<b>Date</b>	<b>Content</b>	<b>Activities</b>	<b>Assignment</b>
Mar 8	Recreational Mathematics problems and where to find them Games and Puzzles Types of puzzles	Survey of RecMath sources	Home: Choose Rec Math problem for final project
Mar 10	Materials: 3D Printing  Intro to Ohio Learning Standards and Common Core Standards in Math Project Work	Visit facilities	Identify learning standards related to the activity you will present. What concepts in my activity will students not know? How to make up for it? In class: Identify key concepts in the topic Identify applicable learning standards Identify playful component
SPRING BREAK			
Mar 22		Student presentations	
Mar 24	Student presentations second try/ rehearsal	Last details of preparation for service activity	Project selection due
Mar 29	No class in lieu of service activity Presentations with community partner		Each student is required to lead one workshop and attend a second one as support Classes are canceled this week to make up for service time Home: Written self-evaluation of activity with community partner
Mar 31			
Apr 5	<ul style="list-style-type: none"> <li>Writing a lesson plan or activity script</li> <li>Materials: paper cutter, craft materials, Zome tools and other specialized materials, online interactive tools (Geogebra)</li> </ul>		Home: Polished script for the activity presented In class: Solve challenge: build something to convey a given concept
Apr 7	Project work		
Apr 12	Project work		
Apr 14	Class canceled in lieu of JRMF activity workshop		Attend JRMF Activity Project Draft due by Sunday
Apr 19	Project work		
Apr 21	Final Project presentations		
May 3	Exam week - No class		Final Lesson Plan write up and Reflection on impact of course on self due

## Academic Misconduct

It is the responsibility of the Committee on Academic Misconduct to investigate or establish procedures for the investigation of all reported cases of student academic misconduct. The term “academic misconduct” includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with examinations. Instructors shall report all instances of alleged academic misconduct to the committee (Faculty Rule 3335-5-487). For additional information, see the Code of Student Conduct <http://studentlife.osu.edu/csc/>.

## Mental Health Statement

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce a student’s ability to participate in daily activities. The Ohio State University offers services to assist you with addressing these and other concerns you may be experiencing. If you or someone you know are suffering from any of the aforementioned conditions, you can learn more about the broad range of confidential mental health services available on campus via the Office of Student Life’s Counseling and Consultation Service (CCS) by visiting [ccs.osu.edu](http://ccs.osu.edu) or calling 614- 292-5766. CCS is located on the 4th Floor of the Younkin Success Center and 10th Floor of Lincoln Tower. You can reach an on call counselor when CCS is closed at 614-292-5766 and 24 hour emergency help is also available through the 24/7 National Suicide Prevention Hotline at 1-800-273- TALK or at [suicidepreventionlifeline.org](http://suicidepreventionlifeline.org).

## Disability Services

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12th Avenue.

## Title IX Statement

Title IX makes it clear that violence and harassment based on sex and gender are Civil Rights offenses subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories (e.g., race). If you or someone you know has been sexually harassed or assaulted, you may find the appropriate resources at <https://titleix.osu.edu> or by emailing the Ohio State Title IX Office at [titleix@osu.edu](mailto:titleix@osu.edu).

## Diversity Statement

The Ohio State University affirms the importance and value of diversity in the student body. Our programs and curricula reflect our multicultural society and global economy and seek to provide opportunities for students to learn more about persons who are different from them. We are committed to maintaining a community that recognizes and values the inherent worth and dignity of every person; fosters sensitivity, understanding, and mutual respect among each member of our community; and encourages each individual to strive to reach his or her own potential. Discrimination against any individual based upon protected status, which is defined as age, color, disability, gender identity or expression, national origin, race, religion, sex, sexual orientation, or veteran status, is prohibited.