MTH 322: Concepts of Geometry - Fall 2019

Department of Mathematics, University of Rhode Island

Quick Details

Instructor: Dr. Michael Barrus

Office Location: 101C Lippitt Hall

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Office Hours: (Tentatively) Mon @ 9:30-10:30 am and again at 2-2:50 pm, Thurs @ 11-11:50 am, and Fri @ 2-2:50 pm

Meeting Times: MWF 11:00 – 11:50 am

Prerequisites: MTH 215 or permission of instructor

Course Description

Survey of geometrical systems including non-Euclidean, affine, and projective spaces and finite geometries. A modern view of Euclidean geometry using both synthetic and analytic methods. –*URI Undergraduate & Graduate Catalog*

Course Goals

Geometry is one of the oldest of the mathematical sciences, and it is here that we find the historical origins of mathematics' modern emphasis on proof and rigor.

This course will provide an introduction to geometry, with a primary emphasis on Euclidean geometry and additional emphases on the historical development of the field and on clear written and oral exposition. At the end of the course, students will be able to recall and apply basic geometric results, give basic examples of how and why Euclidean and non-Euclidean geometries differ and how they relate to our interactions with the world, and be able to identify and apply good principles of presentations of mathematics.

Student Learning Outcomes

In harmony with the course goals above, a list of learning outcomes (i.e.,

content-specific skills and abilities you should develop through our coursework) will be provided in our classroom management system Sakai. These learning outcomes should assist you in evaluating your learning and preparing for assessments, and they will be updated as needed.

Required Text
Euclidean and Non-Euclidean Geometries (4th edition) by Marvin Jay Greenberg. W.H. Freeman and Company, 2008. ISBN: 978-0-7167-9948-0

Using the textbook is not optional—this course will rely on your reading and digesting the material in the textbook. However, please note the following:

- In an effort to make the textbook more affordable, assignments and other requirements will also be designed so as to be completed using the 3rd edition of the text, which may be purchased from various sources at a much lower cost. Please note that the 4th edition contains many high-quality improvements over the 3rd edition and is worth checking out, but the 3rd edition is an adequate substitute for what we will do during the course.
- Additionally, a few copies of the 3rd edition will be available for borrowing for short periods of time from the instructor's office (101C Lippitt Hall); please don't hesitate to ask if you wish to borrow a copy.

Required Technology
We will use two pieces of free software called GeoGebra and NonEuclid, which are freely available for download at, respectively, www.geogebra.org and https://www.cs.unm.edu/~joel/NonEuclid/NonEuclid.html. Calculators or other electronic aids may also be used on out-of-class assignments. No electronic device (including calculators and cell phones) will be permitted during any exam.

Instructional Protocol

In class: Classroom time is at a premium, so it must be used efficiently. Expect to have material covered at a fast pace. I will expect you to come having previously prepared for class as described in the paragraphs that follow. Attendance and participation during class meetings will be vital to the learning process, as meetings will be designed to provide needed practice and clarify misconceptions. No points will be attached to attendance in computing course grades, though attendance will be noted and may be used (at the instructor's discretion) in justifying an upward adjustment of a grade at the end of the semester.

Outside of class: Not everything you should gain from this course can be taught during our class meetings. Much of your learning must take place outside the classroom. Based on experience, at a minimum you should plan on studying two or more hours outside the classroom for each hour in class. You should attempt all the homework that is assigned and try additional problems in areas where you feel weak, even if these are not formally assigned.

Regarding the textbook, you are expected to read relevant sections of the textbook for comprehension. The text gives a detailed account of the material of the course. It also contains many examples of the concepts being discussed, and these should be used to supplement the examples you see during class. Read actively, using pencil and paper to work through the material and to fill in omitted steps. It is strongly suggested that you briefly read the appropriate section(s) of the book before the material is presented in lecture. Then any faster-pace presentation during class will make more sense.

After class consider quizzing yourself and otherwise testing your recall and understanding of the textbook and your class notes; this will cement your understanding of the material.

All students are responsible for being familiar with and adhering to the published "Community Standards of Behavior: University Policies and Regulations" which can be accessed in the University Student Handbook. As with most university courses, all class participants are expected to behave in a respectful and safe manner at all times throughout the semester. Please feel free to bring any issues you have with others' behavior to the attention of the instructor. Issues that may arise will be dealt with in as respectful and confidential a manner as possible.

Grading Policy

Grades will be determined through a weighted average with categories and weights as follows:

20%   Homework and classwork
20%   Oral presentation
20%   Written project
15%   One midterm exam
25%   Final exam

Each grade category's components and policies will be described in sections that follow. No extra credit is anticipated for this course, and none should be requested.

Letter grades for the course will be determined by considering your overall weighted percentage according to the following scale:

A course percentage of at least	guarantees a letter grade of at least	A course percentage of at least	guarantees a letter grade of at least
93	A	77	C+
90	A-	73	C
87	B+	70	C-
83	B	67	D+
80	B-	60	D

A course percentage of less than 60% merits a grade of F.

Homework

One or more homework assignments will be assigned each week of the semester and will be due shortly thereafter; specific deadlines will be announced with each assignment. Assignments may vary in content and format, depending on the current needs of the class. Assignment information will be made available on the course's Sakai pages throughout the semester; you are expected to be aware of what has been announced there and through your University-provided email account.

Late and non-completed homework

Please respect the homework deadlines as much as possible and expect that I will strictly enforce the policy stated here. The three (3) assignments with the lowest score for the semester will be dropped in calculating your course grade; please note that multiple assignments may be given each day, and what is dropped are 3 *assignments*, not 3 days' worth of assignments.

Late homework may be accepted for 90% if turned in up to one class period after it is due, and up to 80% of its original value up until 10 University class days after it is due, after which the maximum that can be earned is 50%. By University policy, homework may not be accepted after December 9 at the end of our last class meeting.

When assignments must be turned in late, you are encouraged to turn them in **as soon as possible**, even if it is not a class day. You may bring them to my office, slipping them under my door if necessary, or at the Mathematics Department office suite in 200 Lippitt Hall. Alternatively, you may submit your assignments electronically by emailing them directly to me at barrus@uri.edu; in many cases this will allow you to turn late homework in sooner for a reduced penalty.

Post-assignment review

My goal is to make your homework as helpful of an educational experience as possible, and I am more than happy to review your graded homework after it is passed back to you. Any requests for regrading (on either homework or exams) must be brought to my attention within 2 weeks of the item's return in class.

Oral Presentation

You will give a 10-minute presentation on a topic assigned by the instructor (typically the proof of a geometric result touched on in class). The assignment will be assessed on mathematical content and principles of good exposition (as discussed in class). Guidelines for the presentation will be given early on in the semester.

If this assignment, because of its nature, will be particularly challenging to you, please bring this to my attention privately, early in the semester, so that we can discuss possible help or accommodations I can provide.

Written Project

Towards the end of the semester, you will prepare a written report on a topic assigned by the instructor (typically a historical figure or event in geometry). Projects will be assessed on content and on guidelines for presentation (which will be discussed and announced during the semester).

Midterm Exam

There will be one midterm exam, given during class on **Wednesday, October 30**. The exam will cover material discussed in class up to that point. Details about what the exam will require, and how best to prepare for it, will be provided as the exam date approaches.

Final Exam

The final exam will be comprehensive. Unless otherwise unanimously agreed upon by the instructor and class, the exam will be offered at the official University-designated final exam time and place, which occurs on **Thursday, December 19, at 8:00-11:00 am** in our classroom. University policies concerning the final exam will be strictly adhered to. More information on the final will be given towards the end of the semester.

A Request

In an effort to improve my teaching in future semesters, I'd like to hold on to copies of some student work to use as examples for students in future

semesters of this course and possibly related courses. For these purposes it is helpful to have both correct examples and incorrect ones. At times I may contact you (usually by email) asking if you will allow me to use copies of your submitted work, in an anonymous way, as part of an example in my future teaching. You will be free to ask questions and/or decline, and I will never directly use your work for these purposes without your consent. However, if you are willing to help me and future semesters of students in this way, I will gratefully and respectfully use your (anonymized) work to help me clearly and effectively show students how to learn this course's material. (And of course, if there are mistakes in your work, I'll do my best to help you overcome those, too, no matter whether you grant me permission to save it or not.)

Accommodations for Special Needs

Section 504 of the Rehabilitation act of 1973 and the Americans with Disabilities Act of 1990 require the University of Rhode Island to provide academic adjustments or the accommodations for students with documented disabilities. The student with a disability shall be responsible for self-identification to the Disability Services for Students in the Office of Student Life, providing appropriate documentation of disability, requesting accommodation in a timely manner, and follow-through regarding accommodations requested. It is the student's responsibility to make arrangements for any special needs and the instructor's responsibility to accommodate them with the assistance of the Office of Disability Services for Students.

Any student with a documented disability is welcome to contact me as early in the semester as possible so that we may arrange reasonable accommodations. As part of this process, please be in touch with Disability Services for Students Office at 330 Memorial Union, 401-874-2098, **http://www.uri.edu/disability/dss/**.

Academic Honesty

All submitted work must be your own. If you consult other sources (class readings, articles or books from the library, articles available through internet databases, or websites—including so-called "homework help" sites) these MUST be properly documented, or you will be charged with plagiarism/academic dishonesty and will receive a penalty for the assignment, up to and including a full loss of credit. In some cases, the act or acts may result in a failure of the course as well. In addition, the charge of academic dishonesty may appear on University records. If you have any doubt about what constitutes plagiarism, visit the URI Student Handbook and University Manual sections on Plagiarism and Cheating at

.
For example, academic dishonesty includes (but is not limited to) the following actions:

- Using material, directly or paraphrasing, from published sources (print or electronic) without appropriate citation

- Claiming disproportionate credit for work not done independently

- Unauthorized possession or access to exams

- Unauthorized communication during exams

- Unauthorized use of another's work or preparing work for another student

- Taking an exam for another student

- Altering or attempting to alter grades

- The use of notes or electronic devices to gain an unauthorized advantage during exams

- Fabricating or falsifying facts, data or references

- Facilitating or aiding another's academic dishonesty

- Submitting the same paper for more than one course without prior approval from the instructors.

If you are unsure about whether an action you have taken or are considering is academically honest, ***please ask*** (sooner, rather than later).

Inappropriate Use of Course Materials

All course materials (e.g., outlines, handouts, syllabi, exams, quizzes, slideshows/presentations, lectures, audio and video recordings, etc., whether in tangible or digital form) are proprietary unless otherwise indicated by an explicit license presented with the material. In order to preserve the value of course materials and the educational experiences of later students, and to maintain appropriate copyright status for instructor creations, all rights are reserved; in particular, students are prohibited from posting online or selling any such course materials without express written permission from the instructor.

Religious Holidays

It is the policy of the University of Rhode Island to accord students, on an individual basis, the opportunity to observe their traditional religious holidays. Students desiring to observe a holiday of special importance must provide written notification to each instructor in a timely manner (typically before the holiday).

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Tentative Course Schedule

The following schedule is subject to change with fair notice to be given in class and through Sakai.

Weeks	Date	Topics/Readings
1-2	Sept. 4 – 13	Ancient geometry; Chapter 1: Euclid's Geometry
3-4	Sept. 16 – 27	Presenting mathematics well (the 4 C's) Chapter 2: Logic and Incidence Geometry *(Wed 9/25: Deadline to drop with no transcript entry)*
5-7	Sept. 30 – Oct. 15	Chapter 3: Hilbert's Axioms Class presentations (Oct. 4 & 9) *(Fri 10/11: No class meeting; replacement info provided later)* *(Mon 10/14: state holiday, no classes; Tues 10/15: Monday classes)*
7-9	Oct. 16 – 25	Chapter 4: Neutral Geometry Class presentations (Oct. 18 & 25) *(Thurs 10/17: Deadline to drop with transcript entry)*
9	Oct. 28 – 30	Review (Oct. 28) and **Midterm Exam** (Oct. 30, in class)
10-12	Nov. 1 – 13	More on area, polygons, similarity, and circles (reading material provided in class) Class presentations (Nov. 8) *(Mon 11/11: Veterans Day—no classes)*
13	Nov. 15 – 29	Chapter 5: History of the Parallel Postulate Class presentations (Nov. 22) *(Fri 11/15: No class; rectangles videos/assignment* *Wed-Sun 11/27-12/1: Thanksgiving Recess)*
14	Dec. 2 – 6	Chapters 6 & 7: The Discovery of Non-Euclidean Geometry & Independence of the Parallel Postulate (highlights)
15	Dec. 9	Chapter 8: Philosophical Implications Final words
Final Exam		**Memorial Union Room 315 (our classroom)** **Thursday, Dec. 19, 8:00 – 11:00 am**