MATH 402 - NON-EUCLIDEAN GEOMETRY, FALL 2021, SYLLABUS

Updated: 8/23/2021

SUMMARY

Our over-arching goal is to study non-Euclidean geometry, and develop its foundations in roughly the same manner that it was developed historically. However, this won't really be a history class at all, and we will do so through anachronistic lenses of modern mathematical perspectives. We'll address questions like "What is geometry" and "What does it mean to *do* geometry?" Before the 19th century, mathematicians had very strict ideas about the answers to these questions. The discovery of hyperbolic geometry upended these ideas, and opened the door to vast mathematical possibilities that are still being explored.

This is a lot to unpack, so we will focus on the parts of the story that I most enjoy. We will prepare our minds in the first chunk of the semester mostly by studying the *synthetic and transformational geometry* of the Euclidean plane. Nothing here should be too surprising, but the *methods* will be of particular interest. We will then pivot to hyperbolic geometry, comparing and contrasting its synthetic and transformational properties with Euclidean geometry.

PERSONNEL

Instructor: Eric Samperton. You can call me Professor Samperton, Professor Eric, or just Eric. Whatever you're most comfortable with.

Pronouns: he/him, they/them, or other gender neutral options, whatever you prefer. I'm probably more than happy to participate in your agenda if you have one.

Email: my last name without any vowels @illinois.edu

Phone: 910-922-6414

Personal webpage: `https://smprtn.pages.math.illinois.edu`

The course has a grader, but you should never need to interact with them.

WEBPAGES, RESOURCES AND SOFTWARE

Canvas:

`https://canvas.illinois.edu/courses/15016`

All course resources will be hosted or linked to from Canvas.

Textbook: Hvidsten's *Exploring Geometry*. Do not buy it unless you want to, because a PDF copy is available on Canvas. Please download it to your preferred electronic device.

Software: `GeometryExplorer`, a software for visualizing constructions in both Euclidean and non-Euclidean plane geometries. Available on Canvas. It requires 128MB of RAM to run, and runs on Windows, Mac, and Linux. If you don't have a computer capable of running it, please let me know.

Permanent Zoom coordinates:

`https://illinois.zoom.us/j/89394324112?pwd=eDRxK0JUN2pSS2xMWXFrV25KblNydz09`

Meeting ID: 893 9432 4112

Password: minus1 (Hint: curvature of Poincaré model of the hyperbolic plane.)

I am hoping we can have all of our meetings in person this semester. These Zoom coordinates are just in case we can't.

COVID, OTHER HEALTH AND SAFETY

Building access: In order to keep the class safe, I may occasionally check everyone's building access status in the Safer Illinois app.

Masks: Wear them. If you don't, everyone else will be sad because I'll have to cancel class. Hopefully we can stop wearing them at some point, but don't count on that.

Mental health: Things are wild these days. If you have anything on your mind or anything going on in your life that is making you feel down or distracting you from learning geometry, please reach out to me. I will either try to help directly, or help put you in touch with any of the numerous mental health resources offered by campus.

Run, Hide, Fight: Campus police have asked me to share some info about how to respond in emergency situations.

ORGANIZATION

Lecture/discussions: Class meets MWF 2:00-2:50PM in 1065 Lincoln Hall.

Office hour: Thursdays 5:00-6:00PM in 257C Altgeld Hall.

Regular attendance at the lecture/discussions is **strongly encouraged**, and required in some sense. **Attendance at my office hour at least once is required.** See grading section below.

Communication plan: Feel free to email or text me if you have organizational or mathematical questions. I will often *not* answer math questions over email, but instead prepare a discussion about them for the next class meeting. Note that I won't usually reply to emails or texts over the weekend.

Schedule: Most important things in the class will happen on Fridays. Homework will be made available and due on Fridays by 11:59PM (electronic submission via Canvas). The three midterm exams will all occur on Fridays in class (see below). Our registrar-assigned schedule for the final exam is Monday, December 13, 7:00PM-10:00PM.

GRADING

OH Visit: Talk with me in an office hour at least once at some point this semester. You get 1% for doing so. Of course, you really have to engage with me to earn the point, not just show up. Text me or email me after you do so I don't forget to give you the point. This is to encourage you to take advantage of the most helpful resource for this class—me :-)

CATEGORY	WEIGHT
OH Visit	1%
Participation	6%
Homework	33% (drop 2)
Midterm 1	10%
Midterm 2	10%
Midterm 3	10%
Final	30%

Participation: Our class meetings will be mixed lecture/discussions. There will be occasional opportunities for you to earn participation points (typically by solving practice problems at the board in front of the class). I'll average around 4 opportunities per week, and each will be worth up to 2 points. After completing a participation opportunity, please text or email me so I remember to give you credit. **Y'all can not procrastinate on this, because it is only possible for me to offer a few opportunities in any given week.**

Homework: Homework will be submitted electronically by upload on Canvas, and grades and feedback will be returned electronically via Canvas. It will typically be due on Fridays at 11:59PM Urbana time. Homework can be submitted late up until 11:59PM on the Tuesday after it is due, with a penalty of 20% of the total possible points subtracted for each day it is late (80% Saturday, 60% Sunday,. . . , 0% Wednesday). You can expect to have about 11 homework assignments. I will drop your two lowest scores.

Exams: There will be three midterms and one final. For now, the plan is for them all to be held here in the classroom. There will be no homework due the weeks of midterms. The exam schedule is in the table on the right.

EXAM	TIME
Midterm 1	Friday, September 17, 2:00-2:50PM
Midterm 2	Friday, October 8, 2:00-2:50PM
Midterm 3	Friday, November 12, 2:00-2:50PM
Final	Monday, December 13, 7:00-10:00PM

Letter grades. Your final course letter grade will be determined by applying a curve to the raw scores computed via the above grading breakdown. The curve will be at least as generous as the usual 10 point scale.

ETHICS

Collaboration: I **strongly encourage** y'all to form study groups and collaborate when doing your homework. You must write up your solutions in your own words and with your own understanding (no copying!), but your classmates are your second best resource for learning in this class.

Privacy: I'm a strong believer in student privacy. Please don't share details of health or personal issues with me that you are uncomfortable sharing. Also, you do not have to show your face on Zoom if you don't want (although it really helps me feel better to see your faces).

Cheating: Generally speaking, this class will be very generous with allowable resources. When completing the homework, you may use any library book, or any generally and freely available reading material from the internet you please, so long as you avoid plagiarizing by properly attributing your sources. By "generally and freely available" I mean easily found on the internet or in a library for free. However, so-called homework help services (e.g. Chegg, CourseHero, your "tutor" who just does your homework for you, *etc.*) are completely off limits for all homework assignments and exams. If anyone is found to have cheated (especially via one of the corporate cheating companies), I will work as hard as possible to ensure that I can find a just reason to give that person an F for as many assignments as possible, and, hopefully, failing them for the class. Please see Article 1 Part 4 of the student code.

Copyright. Any course materials (notes, problem sets, videos, etc) I prepare belong to me, and likewise for things prepared by your classmates (unless they say otherwise). Do not share them with people or companies outside our class. In particular, if someone uploads my homework sets or exams to a homework help service, not only will they have violated the student conduct policy regarding cheating, but they will also be violating my copyright, which is both a separate conduct violation and illegal. In such a scenario, I will pursue sanctions for both cheating and copyright violations.

REASONABLE ACCOMMODATIONS AND EQUITY OF ACCESS

The sooner you submit any requests for reasonable accommodations through DRES, the sooner I can ensure you have what you need to succeed. This class will be highly visual. Some of you may have reasonable requests related to things that aren't normally handled via DRES (e.g. colorblindness, an unstable internet connection, a complicated home life). Please let me know about such things if I can help.

GET OUT CLAUSE

If you were unaware, there's a worldwide pandemic going. Things might have to change. I promise not to be capricious about it.