# Syllabus

## Basic Info

| | |
|---|---|
| Instructor:<br><br>Dr. Natasha Komarov<br>nkomarov@stlawu.edu<br>315-229-1864<br>Valentine 220<br>(Come say hi) | Textbook:<br><br>None!<br>We will have readings throughout the term from a variety of sources. Some will be articles and others will be parts of textbooks. All will be available either online or at the library. |
| Class meetings:<br><br>Valentine 106<br>Tuesdays & Thursdays<br>10:10-11:40am | Office hours:<br><br>TBA<br>These will be determined based on your responses to the survey here. |

## Course description

This course is generally going to be run by YOU, the students. I will introduce some topics, and give a few introductory lectures when we enter a new mathematical subfield. Other than that, most of class will be run by you giving presentations about what you learned from various assigned readings, and a class discussion. A typical half of a class meeting will look like this:

- discussion of whatever may have come up at the end of last time, or in a blog, etc.
- someone's presentation
- class discussion of said presentation/associated blog post

Or like this:

- I introduce/explain some concept/topic
- class discussion of said topic

Generally, there'll be a 5 minute break between the two halves of the day. Note that this leaves something like half an hour for the discussions, so make sure to come in with some ideas for that (and if you're presenting: make sure you do your best to promote discussion). Participation is a large part of this class!

Rather than traditional problem sets, your out-of-the-classroom homework will mostly consist of participating in the course blog (for more on this, see the "Blog" section), preparing your presentations (for more on this, see the "Presentations" section), final presentation, and final paper (for more on this, see the "Final Project" section), and reading whatever is assigned (these will be sporadic and announced in class and on this website).

## Topics to be covered

- Combinatorial games
  - Nim
  - Sprague-Grundy values
  - Sums of games
  - Various examples of impartial combinatorial games & analysis thereof
  - Some exploration of partizan games
- Pursuit-evasion games
  - Cops & Robbers
  - Variants of Cops & Robbers
  - Applications
- Games of chance
  - Overview of probability basics
  - Analysis of "simple" games involving randomness
  - Pursuit-evasion games involving randomness
  - Nash equilibrium
  - Applications of game theory (biology, psychology, economics, computer science, etc.)

## Presentations

Throughout the term, you will each give several presentations. These should each be at least around 10 minutes long, but feel free to take as long as 30 minutes. The primary objectives of any one of these "mini-presentations" is for you, the resident expert in the topic (after you've spent some time reading things and synthesizing the information) to impart upon your audience a helpful and intuitively understandable short lesson on the topic, and to facilitate a discussion about it. These presentations do not need to be particularly polished, and needn't involve slides or posters; visual aids are always appreciated but not required. Each of these presentations will be accompanied by a blog post (for more on this, see the "Blog" section). Since everyone is expected to have read the blog post by the time you present on it, you may skip or briefly summarize the introductory details in your presentation and go straight for the good stuff.

As you plan your mini-presentations, you should use the following thoughts as your guide to depth, breadth, etc.:

- Do you have a broad enough understanding of the topic to have a handle on the main (or one of the main) "nuggets" of information (which is what you'll present in class)?
- Do you have a deep enough understanding of the topic to be able to write a meaningful and interesting blog post on the topic? What is meant by "meaningful" and "interesting" really depends on you! If you were reading this post, would you find it interesting? Your goal is for the answer to be yes before you click "publish." :)
- Is there enough material between the blog and the presentation, both in terms of depth and breadth, to facilitate a class discussion after the presentation (assuming your colleagues have already read your blog post, too)?

You should put in a good effort to make this blog/presentation interesting, not only to your audience but also to you. But sometimes, it happens---the topic you're researching is one you just find so dull that there is simply no way for you to write an interesting post or give a good presentation about it. Feel free to let me know (a **reasonable** amount ahead of time, at an absolute minimum of at least 3 days before the blog is to be posted) and we'll see if there is some alternative that we can come up with together.

If you for some reason had to skip a presentation, or did a poor job with one, you can always make this up by coming up with a suitable replacement idea and presenting on that. While you can write extra blog posts any time (for more on this, see the "Blog" section) without consulting me, please do let me know if you also want to give a presentation on it, so that I make sure to set aside the time for that in class. We'll almost always be able to arrange this!

# Blog

We'll have a course blog, located here. Everyone will write a few posts by the end of the term. The goal with the blog will be to learn about new stuff and facilitate class discussion. The blog will largely function in conjunction with the presentations. For more on how to write these posts and what's expected of you, see the guiding thoughts in the "Presentations" section, and check out the first two posts on the blog.

While you are required to make a post in advance of each presentation, you also have the option of making a post any time. This, of course, contributes positively to your participation grade (so from that perspective, it may be a smart thing to consider if you've had a couple of busy weeks in which you weren't able to participate in the blogs or class discussions as effectively). It also, more importantly, contributes to all of our understanding and excitement about game theory! You can also choose to give a presentation on this extra stuff you posted. Again, this is excellent for all of our knowledge. But it is also good for your grade---if you wrote a post or gave a presentation that just wasn't that good, you can come up with your own "make up" blog-presentation combo to replace that in your grade computation. The grades are really not as important a part of this class as learning new things, so I am happy to be as accommodating as humanly possible, particularly when you're asking to contribute to class discussion and learning. :)

# Attendance & participation

Since a lot of this class is going to involve you guys presenting and discussing information, it's very important that you show up and participate in discussions! This class can't succeed without that. Your participation grade is determined by your participation in class discussions as well as in blog comments. See the first blog post for more information on how and when to comment on blogs. Of course, in order to be able to participate in class, you need to be attending. Sometimes, things come up: excusable reasons for missing class (and not having this negatively impact your attendance grade) include family emergency, illness, and travel for sports games. You must let me know *ahead of time* if you have to miss class for *any* reason, and absences that are not preceded by such an e-mail will not be excused, regardless of the reason for them.

*Cell phone policy*: No cell phones should be out during class. If you have to answer an urgent call or text, feel free to do so, but please leave the room. If your phone is in use during class, this will contribute negatively to your participation grade (answering quick calls or texts outside will not contribute negatively to your participation grade, unless of course you do it so often that you are not participating). I also reserve the right to grab your phone and post embarrassing stuff to your Instagram.

*Laptop policy*: Unless noted otherwise, no laptops (or tablets) should be out during class. If they're necessary on any particular day, I'll let you know in advance.

Please note that in the event of an absence, the in-class participation component for the day cannot be made up, as there's really no way to enable that. You can and *should* make sure to participate on the blog post(s), though, even (and especially) if you are missing the presentation(s) in the next class period.

# Final project

You will also each give one final presentation and write a final paper, on a topic of your choice. This presentation can take the form of a 15-30 minute talk with slides (e.g. using Beamer), poster presentation, computer game, video, or some other creative form of information-dispersal (if you have some other idea, let me know, and it'll probably be totally fine by me---the more creative the better).

If you are taking this course for Honors in Mathematics, your options for the final presentation are a little more limited, but include a Q-club talk or a poster presentation at a conference. If this applies to you, please come speak with me early on in the semester so we can plan appropriately.

The final paper will be on the same topic as the presentation. This paper should be able to be read and understood by your peers, i.e. by upper level math majors. You needn't explain basics (e.g. you can assume your readers know what a graph is) but you should assume very little knowledge in the specific area you're discussing (e.g. don't assume your readers are familiar with the rules of Red-Blue Hackenbush). Both for your final presentation and for the accompanying paper, you should cite whatever sources you use, which should include some research papers. You may choose to write a paper that involves doing original research, but this is certainly not required---expository papers are also great. Again, if you're taking this course for Honors, the requirements on your final paper will be a little more stringent, so come talk to me as early as possible about that.

You are free to work together (in groups not exceeding 3 students per project, to keep things reasonable). If you work with other people, you'll all be responsible for handing in a single final paper, and for giving the final presentation together. How you choose to do that is up to you. Each member of the group will rate each of the other members on their participation and effectiveness, so it'll be up to each of you to stay involved with the project. Your grade for the final project will then be determined both by the grade you earn on the project itself, and by the ratings you received from your group-mates. More specific information on this, as well as on final project subject area choices, will follow a few weeks into the semester, when we start discussing the final projects in class.

# Grades

**Overall grading philosophy**
Please note that while I do not anticipate giving many 0's (which would really only happen if you simply skipped your presentation or blog, or wrote hot garbage nonsense in your blog and then presented this hot garbage while drunk), 4.0's should also not be taken for granted. A 4.0 is the Bigfoot of grades: there are occasional sightings, and finding one is an excellent goal, but *not* getting one isn't a bad sign, either. Here is what the whole number grades mean in this class, with the fractional ones in between moving linearly from one to the next:

| | |
|---|---|
| 0.0 | **Disastrous**. No effort was put into the assignment, and/or you didn't show up. |
| 1.0 | **Barely acceptable**. Well... you showed up. You even did some of the work. But you seriously phoned it in. |
| 2.0 | **Decent**. You did the assignment. You provided *some* benefit to your audience beyond just handing over the links and letting your audience read for themselves. But that's about it. |
| 3.0 | **Solid**. You put in the effort and came out with a solid assignment. Your explanations provided a clear benefit to your audience, and led to a good discussion. |
| 4.0 | **Extraordinary**. Holy crud. You knocked this one out of the freakin' park. There is absolutely *no* way your work can be improved upon. |

**Presentation & blog rubric**
Since every topic will be different, and everyone's presentation and blog-writing style may differ as well, the presentations and blogs will be graded based on the following, intentionally loose rubric. Each item in the rubric will be given a GPA-style grade of 0 to 4 (see above chart for what those numbers mean).

| **Element** | **Description of element** | **Weight of element** |
|---|---|---|
| Breadth | give context for your topic; know which "nuggets" need to be presented in order to give your audience a proper handle on this topic. | x3 |
| Depth | show that you understand enough about this topic that you're able to put together an interesting and meaningful blog/presentation. | x3 |
| Synthesis | use more than one single source, and synthesize the material from your sources into a cohesive blog/presentation; provide benefit to your audience beyond what they could easily have gotten just by reading the Wikipedia article (though the Wikipedia article is a perfectly good starting point). | x2 |
| Discussion | facilitate active discussion; if discussion points/questions are not being raised by your audience, it's up to *you* to come prepared with some "back up" discussion-starters; engaging your audience by having them play a game is great, so long as we can come together afterwards and chat about what (mathematically) we've learned. | x2 |
| Citations | cite all of the sources used, making it clear to your audience where they can go for more information. For consistency, use Chicago-style citations. These can be generated using the citation machine. | x1 |
| **Total** | | 11 |

*Example:* You put together a presentation that gets a 3.0 in breadth, a 2.5 in depth, a 3.75 in synthesis, a 4.0 in discussion, and a 4.0 in citations. This gives you a total score of 3*(3/11)+2.5*(3/11)+3.75*(2/11)+4*(2/11)+4*(1/11)=3.27.

**Overall course grade**
The course grade will be computed using the following elements:

| | |
|---|---|
| Attendance | 5% |
| Participation | 15% |
| Course blog | 30% |
| Presentations | 30% |
| Final project | 20% |

# Accommodation policy

I encourage any students with disabilities to discuss appropriate accommodations with me.

Any student with a documented disability requiring academic adjustments or accommodations should speak with me by the end of the second week of the term. All discussions will remain confidential, although Disability and Accessibility Services may be consulted to verify the documentation of the disability and advise on an appropriate response to the need. It is important, however, that you talk to me soon, so that we can make whatever arrangements might be needed in a timely fashion. For more information on the accessibility policies at St. Lawrence, please refer to the Disability and Accessibility Services provisions.

Some students may wish to take part in religious observances that occur during this academic term. If you have a religious observance that conflicts with your participation in the course, please meet with me by the end of the second week of the term to discuss appropriate accommodations.

Similarly, if you are involved with athletics or any other organization which will require you to miss class, please let me know by the end of the second week of the term (including exactly which dates you will be absent and why).