Knot Theory Summer Seminar Syllabus

1 Seminar details

- Time: MTWR 9:00am-10:00am (lecture session) and MTWR 1:00pm-2:30pm (problem session)
- Classroom: Hayes-Healy 117
- Textbook: *Knots and Links* by Peter Cromwell
- Mentors: Mitchell Faulk (mitchellmfaulk@gmail.com) and Jack Burkart (jburkart26@gmail.com)
- Office Hours: 10:00am-11:30am (Mitchell) and 2:30pm-4:00pm (Jack)
- Office Location: TBA

2 Description and goals

This is a fast-paced, student-driven seminar on knot theory and point-set topology. The main goals include

(i) To study mathematics in a more focused and sustained manner than during the school year.

(ii) To practice communicating mathematics, both verbally and non-verbally.

(iii) To develop a toolkit of topological concepts, techniques, and ideas.

(iv) To gain a geometric intuition about topology by studying knots and related geometry.

3 Expected work

There are three primary tasks: lectures, problem sets, and a paper.

3.1 Lectures

The lectures will occur in the morning, and will be given by students (except on those days where Jack or Mitchell plan to speak). They will begin at 9:00am, and last for about an hour. In the Google spreadsheet for the course, you will find a tentative syllabus with the topics scheduled for each day. The lectures will be assigned on a first-come, first-serve basis. You may choose up to two lectures to sign up for right now; please update the Google spreadsheet if you wish to put your name down for a specific day.

It is expected that some thought and preparation will be given to the lectures. Please talk with Jack or Mitchell if you have any questions about the material, or how best to present it. We would be happy to offer suggestions or lead you to other resources. We strongly encourage alternative lecture techniques (such as fun activities, visuals on Mathematica, handouts, etc.).

Even when not scheduled to give a lecture, you are expected to show up—on time!—to daily meetings. We hope you will be attentive and respectful of your classmates. You are strongly encouraged to ask questions. We hope that our daily meetings can be more like discussions rather than monologues.

3.2 Problem sessions

We will have meetings in the afternoons where students may present solutions to problems from the homework. If you wish to present a solution, write your name on the blackboard together with the problem you want to solve before the MORNING meeting. You may only select one problem at this time. (If we have extra time during the afternoon session, you may choose another problem to present.) Presenters will be selected on a first-come, first-serve basis. Thus you are encouraged to arrive early to the morning meeting if you wish to present on a particular problem.

3.3 Paper

You will write a term paper on a special topic. This will be due at the end of the eight-week session. You are encouraged to talk with others, including Jack and Mitchell, about any questions they may have. (Both Mitchell and Jack have experience using LaTeXto typeset their math documents.) Toward the end of the summer, you may also schedule an additional talk on your topic if you so choose. Any other questions about the expectations of the paper can be directed toward Professor Diller.

4 Points-system

You can earn or lose points by you behavior, and these points will be tallied throughout the summer. The three students with the most points at the end of the summer will receive special prizes, courtesy of the mentors. Tasks that may earn points include

- Presenting a correct solution to a problem.
- Creating a typed copy of lecture notes.
- Creating a typed copy of solutions.
- Creating an approved homework problem (one per week per student).
- Contributing positively to the seminar session (e.g. asking questions).
- Crafting a handout, Mathematica demonstration, or equivalent supplement to our seminar meeting.
- Noting a typo on the homework or lecture notes.
- Presenting an additional talk on your paper topic.

Behaviors that will lose points include

- Being tardy without excuse.
- Being absent without excuse.
- Inappropriate behavior during meetings (sleeping, texting, etc.)

We hope that the points-based system will foster a healthy competition and encourage participation. However, if you find the points-based system distracting, please let us know, and we will consider terminating it.

5 Advice

You are expected to read the relevant sections of the book before our morning meeting. If you have any questions, bring them to the meeting. (These can earn points.) If you still have questions, you may bring them up to Jack or Mitchell, or another student!

There will be many assigned problems, probably too many for you to complete. Try as many as you can. You are encouraged to work together and talk through your solutions with others. You can also talk with Jack or Mitchell about any of the problems. Feel free to stop by our office hours.

If you are having difficulties with the material, talk to someone! Everyone who has done serious mathematics knows the importance of talking with others about their difficulties. You can always talk with Jack or Mitchell. You can also talk with your classmates, as this is often the most helpful technique.

We hope that this summer can be fun and exciting. Please inform us of any ways you think that could improve the program.