

18.821 Math Project Lab Course Introduction, Fall 2016

This is a course about doing and communicating mathematics.

Working in teams of three, you will do three projects over the course of the semester. Each project consists of the study of an open-ended problem chosen by you from a list we provide. You will find your own examples, develop your intuition, make your own precise questions, and find your own proofs. The projects require relatively little background to get into. No particular course or material is essential, but anything you've learned could be useful. For each of the three projects, you will meet once a week with a project mentor who will help you confront the challenges of research.

You will write a paper about each of your projects. You will also give 45 minute presentations about two of the projects to the class. You will figure out how to introduce your topic, how to motivate it, how to give intuition for it, how to write clear and complete proofs, and how to summarize the main ideas. The instructors will help guide you in the challenge of sharing ideas.

In this class, you'll learn about doing research and communicating math mostly by doing those things. At the start of the semester, we'll have some workshops on how to do research and how to communicate mathematics, to give you tools to get started in your own practice. Throughout the course, you will practice research and exposition, and the instructors will help guide you.

This Communication-Intensive subject fulfills the Institute Lab Requirement.

Course work. In your team of three, you'll start working on the first project after our second class. You'll start meeting with your project mentor the week of September 12. The first draft of the first project will be due in class on September 30. *Due in class* means that the \LaTeX file should be emailed to dav@math.mit.edu **by the end of class on the due date**. For draft papers, the purpose of the deadline is to allow the staff time to provide feedback to you. Timely feedback on an imperfect draft is of more value than delayed feedback on a better draft, so it's in your interest to meet this deadline.

After you turn in the first draft of the first project, we will have debriefings. The debriefing is a meeting with Professor Vogan and your mentor to describe the work you've done on the project and reflect on the comments on the first draft. After the debriefing, you'll revise the paper and turn in a final draft (due in class on October 12). For final papers, the purpose of the deadline is fairness to your fellow students. **Late submission of a final draft will affect your grade.**

You will give two 45 minute class presentations on your projects during the semester. The first class presentation will probably be October 12. We will have about two presentations per week from early October until the end of the semester. The Friday before each of your presentations, you will do a practice presentation with your mentor and other instructors. This is a chance to discuss and explore, and to work on the craft of presenting mathematics.

Class time and meetings outside of class time. Our class time is Monday and Wednesday 1–2 pm and Friday, 1–3 pm, in Room 2-147. But we don't necessarily meet as a whole class every class time. In the first month, we will have several workshops during class time Monday through Friday, exploring how to do research, how to work as a team, and how to write and present mathematics. After

that, we will meet Mondays and Wednesdays for project presentations. *Attendance is required at all project presentations.* Your questions and feedback (**submitted in writing on forms we'll provide**) will be an important part of the experience for the groups presenting.

On Fridays beginning October 7 we won't meet as a whole class. The practice presentations for the two teams presenting the following week will take place then, but only the teams practicing and the instructors will be there.

Your team meetings with the project mentor and the debriefings will happen outside of class time. The people meeting will coordinate the times.

Getting started. Our first day of class is Wednesday September 6. In the first week of class, we will form the teams of three and each team will select a first problem. We will have workshops about how to do research and about teamwork. After the first week, you'll start working on your first project. You'll have your first meeting with your project mentor the following week, September 12-16.

The list of projects is on the class web site starting September 1.

Staff information.

David Vogan, dav@math.mit.edu, 2-355, 617-253-4991

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Thao Do, thaodo@mit.edu, 2-231D

Susan Ruff, ruff@math.mit.edu, 2-370, 617-455-8248

Malcah Effron, meffron@mit.edu, E39-368, 617-324-2302

Ari Nieh, anieh@mit.edu, E39, 510-292-0899

David Vogan is the lead instructor. David Vogan, Tristan Bozec, and Thao Do are the three project mentors. Over the course of the semester, you will do one project with each of them. Susan Ruff, Malcah Effron, and Ari Nieh are the course communication experts. They are important resources for writing and presentations. All of the instructors will help with grading papers, giving feedback, and the practice presentations.

Grading. The grade is based on the three final papers (20% each), the two presentations (15% each), and your attendance and participation in the class (10%). The grades are based on both the mathematical content and the exposition. Before you start working on writing and presenting, we'll give you guidance about what we're looking for in the writing and how to go about it.

In working on your projects, the one thing you're *not* allowed to do is to use past student papers on these projects. You can look in the mathematical literature for relevant results if you want. You can cite and build on results that you find in the literature. Most students have found that it's more fun to explore yourselves, but learning what is in the literature is part of math research and it can be part of your research project.

Advice from previous students.

"Be nice to one another (and respect one another). Promptly respond to a teammates e-mail/message, at least to let him/her know that you saw the message. Have fun with the problems, don't worry so much about grades."

"Ask for feedback throughout the progression of your projects."

"I think the setup of the class, overall, is very good. You very much get out what you put into this class."