# List of Courses Taught

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### 1. Bowdoin College

Over the 2018-2019 academic year, I have been fortunate to posses a liberal arts teaching experience at Bowdoin College. As a Visiting Assistant Professor, I was responsible for designing my own course curriculum, planning lectures and handouts, designing and grading exams, holding office hours, and assigning individual and team homeworks. I also coordinated and mentored several graders, teaching assistant and study group leaders. Brief description of each of the courses I have taught are listed below.

1.1. **Math 1600, Differential Calculus.** In the Fall semester of 2018, I taught Math 1600, Differential Calculus. The class, geared mostly towards freshmen and sophomores, consisted of two one-and-a-half hour of class meetings and one-and-a-half hour of lab sessions using Mathematica per week. Building on the traditional outline of the course structure, I decided to also include numerous practical examples and applications of derivatives via relevant topics, questions regarding optimization, and related rates etc. A main focus of the course was not just being able to calculate derivatives using different rules, but also to be able to interpret and describe symbolic equations using words and vice versa. Additionally over the semester, I created a number of lab sessions which helped solidify the abstract ideas by doing numerical estimations through Mathematica, and by implementing various root-finding algorithms e.g. interpolation, and Newton-Raphson method.

A typical class meeting for this course consisted of my lecture, individual thinking by the students using the 'think-pair-share' strategy and occasional small group board work on challenging or multi-part problems. I also kept track of student progress through weekly quizzes and occasional problem set handouts in class. I made practice problem sets before the exams and had individual follow-up discussions with the struggling students. I tried to be available as much as possible outside the class as well, because for a lot of the students, this was the first college Math course and I wanted them to get the correct idea of how to learn Math properly from the very beginning. A set of evaluations for this course will be available soon.

1.2. **Math 1800, Multivariable Calculus.** I have and will be teaching Multivariable calculus at Bowdoin college both semesters on 2018-2019 academic year. This class is geared towards mathematically inclined students who have learned differential and integral calculus, and would like to broaden their horizon. My class in Fall semester, taught three times a week for an hour and a one-and-a-half hour lab session, was unlike the other sections because I had only eight students and so I could incorporate a lot of group discussion style techniques fairly regularly. I could easily keep track of every students' performance and struggles, and could create individualized work for them to catch up with the rest of the class. The set of handouts created for this class is available through my website. A tentative syllabus for my upcoming spring semester is available on my website.

The short class size also allowed me to create a list of very interesting and challenging collaborative projects for the students, e.g. they learned applications of regression techniques in data science, an introduction to the Gradient descent method of optimization techniques used in machine learning, practical modelling of climate change evidences, the Normal probability distribution, and estimating expected values of real-life functions. Next semester, I plan to also include some discovery projects that are more geometric in nature. In the later half of the course, I heavily relied on demonstrations using Mathematica and flowchart summaries in class when talking about Green's theorem, Divergence theorem, and Stokes' theorem. We used *Desmos* and *Mathematica*, both to visualize three dimensional pictures of surfaces, vector fields etc. as well as to get help with particularly laborious calculations for the group works.

1.3. **Independent Study - Undergraduate Mentoring.** In Spring 2019, I will be working with Sam Harder, a Junior at Bowdoin College, guiding an independent study course in Dynamics. Having finished the Analysis course at Bowdoin, he is currently enrolled in intro to dynamics, complex analysis and functional analysis courses at Eötvös University at Budapest. Although the structure of the course is not entirely fleshed out yet, I plan to help him pursue his interests with graduate level topics on Dynamics. In particular,

the goal is to have a crash course on geodesic flows and Ergodic theory of Anosov diffeomorphisms, with an aim of learning about the Marked Length Spectrum Rigidity and the Hopf conjecture.

1.4. **Math 2000, Linear Algebra.** I will be teaching Math 2000, Linear Algebra in spring semester of 2019. The students taking this course are not expected to have experience with writing proofs, as such, we will spend a significant amount of time looking at applications drawn from linear systems of equations, discrete dynamical systems, Markov chains, computer graphics, and least-squares approximation.

## 2. University of Chicago

Besides my liberal arts teaching experience, I was also fortunate to have the opportunity of teaching as a graduate student and after my PhD at the University of Chicago.

2.1. **Proof-Based Methods.** After finishing my PhD in summer 2018, I had the unique experience of teaching an *Introduction to Proof* style class to a group of academically talented incoming first-year students at UChicago through the *Chicago Academic Achievement Program* Summer academy, conducted by the *Center for College Student Success*. This class was designed to expose the students to the academic rigor expected of them as they enroll into introductory Math courses at the college, as well as provide a support framework to help them navigate through the new social and cultural norms.

The classes met for four one-and-a-half hour meetings every week for six weeks. As a class essentially to develop Math reasoning, we covered ideas and problem solving strategies from a broad area of topics such as Number Theory, Combinatorics, Graph Theory, Sequences, and limit Calculus. Besides the final exam, the students also were required to give a presentation in front of their peers which I believe helped them with their Mathematical writing and interaction skills. I tried to keep the atmosphere of the class as casual as possible so that they do not get overloaded with too much expectation. The syllabus for this class as well as the list of sample projects that I provided to the students in class is available in my website.

2.2. **Math 195, Mathematical Methods for Social Science.** In Autumn 2017 and Fall 2018, I taught semester long course titled Mathematical Methods for Social Science. The course consists of topics that are important for students who are planning to become majors in Economics, Political Science, Mathematical Linguistics etc. As such we covered vectors and multivariable calculus up to optimization, but instead of talking about Green's theorem, we covered linear programming next and finally sequences and series with the goal of learning Taylor approximations. Besides the class, I also worked with some of the interested talented students in an independent study session on Game Theory and a project on *Least Unique Bid Auction.*

2.3. **Math 150's, Standard Calculus Sequence.** As a graduate student college instructor, I taught independent section of courses in 2014-2017, usually with 15-30 students each, for an average 3 hours a week. The yearlong rigorous one-variable and multi-variable *standard Calculus* sequence (taught thrice) is designed for science, economics and Math majors. As the instructor of record, I was responsible for designing my own course curriculum, planning lectures, designing and grading exams, holding office hours, and assigning homework. I also mentored teaching assistants, and coordinated junior tutors.

2.4. **Math 196, Linear Algebra.** In summer of 2017, I taught an intensive five week long computational *Linear algebra* course that met for six hours a week. It was offered through the *Graham School of Continuing Liberal and Professional Studies* for computational linear algebra, intended primarily for students in the social sciences who have completed single and multivariable calculus sequence. However, the students weren't expected to have much experience with writing proofs and as such, we spent a lot of time working on examples from many disciplines, in particular ones that relate to their primary fields of interest.

2.5. **Math 133, Elementary Functions and Calculus.** I taught a quarter long course on Vector calculus titled 'Elementary Functions and Calculus' to non-science (mostly History, English, and Theater) majors. Teaching students with very little technical background was an unparalleled learning experience.

2.6. **Other Responsibilities.**

2.6.1. *Undergraduate Mentoring - DRP and REU.* At the University of Chicago, I mentored eight undergraduate students (during 2014-2017) through the *Directed Reading Program* (DRP) and the summer *Research*

*Experience for Undergraduates* (REU) on a wide array of topics from geometry, linear algebra, topology, dynamics of group action etc. We usually met twice a week for about 10 weeks, where the students would discuss a paper they have read and any original work they have done, followed by me outlining the next possible direction of approach and available useful literature. In both cases, I also helped them learn mathematical writing and coached them for an end-of-quarter presentation or written paper. The list of students and their papers are available via my CV.

2.6.2. *As a Teaching Assistant and Grader.* In 2013-2014 academic year, I worked with professor Eugenia Cheng as a teaching assistant for a year-long *Honors Calculus* sequence, and later worked as a grader for graduate courses on Algebraic Topology, Differential Topology, Differential Geometry, and Riemannian Geometry. Details on these are listed in my CV.