

PHILOSOPHY OF MATHEMATICAL PRACTICE (400-500 LEVEL)

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Office hours: TBD and by appointment.

Course Overview

The philosophy of mathematical practice is a fairly recent development within philosophy of mathematics, resulting from a desire to more seriously consider contemporary mathematics and the working practice of mathematicians. This course will be split into six sections to cover some of the main topic within philosophy of mathematical practice. These sections are as follows: the general idea of philosophy of mathematical practice, proof, explanation, diagrammatic and visual reasoning, mathematical cultures, and mathematical beauty. By the end of the semester students will:

- have knowledge of some of the major topics in philosophy of mathematical practice.
- have the ability to meaningful engage in rigorous discussions and formulate philosophical ideas in written form, as well as have the ability to critically analyze and assess philosophical arguments and formalize them into premise/conclusion form.

Texts: All of the course readings will be made available online. Several of the readings come from the following text, which also an excellent source for outside readings related to the topics covered in the course:

Mancosu, P., (2008) *Philosophy of Mathematical Practice*, New York: Oxford University Press.

Assignments

Summary Papers. Each student is required to turn in 5 summary papers throughout the semester. Students can only turn in one summary paper per section. These papers should be 2 – 3 pages long, consisting of a short summary of an assigned reading and the student's thoughts/response to that reading. The response portion of the paper should demonstrate that the student has engaged with the reading in a careful and thoughtful way. These papers will be graded on a scale of 0 – 3. Students will receive a **0** if they fail to turn in a summary paper, a **1** if they have failed to accurately summarize or engage with the reading, a **2** if they accurately summarize the reading but do not include a thoughtful response, and a **3** if they accurately summarize and thoughtfully engage with the reading. These papers should be turned in before the class discussion of the assigned reading.

Exams. There will be two exams for this class, a midterm and a final. The midterm will be half-way through the semester and the final will be during exam week. For each of the exams, students will be given a list of 10 possible exam questions at least a week in advance of the exam. The actual exam will list 5 of these questions and students will be expected to answer 3 of them. These will be essay-style questions and a satisfying response should comprehensively address all parts of the question and include the student's on thoughts on the issue. Before each exam I will host an out-of-class review session to help students prepare.

Term Paper. The major assignment for this course is the final paper, which will be due during finals week. This will be a 15-20 page paper that engages with and develops new ideas about one of the topics covered during the semester. This assignment will be a work-in-progress throughout the semester, and will consist of multiple smaller assignments. These assignments are as follows:

Paper Proposal (5 pts): The paper proposal will be due half way through the semester. A proposal should include the following information: the question the student is interested in answering, propose an answer to this question, and identify the readings the student plans to engage with.

Meeting (5 pts): After receiving feedback on their proposal, each student is required to schedule a meeting to discuss their paper ideas with me. It is the responsibility of the student to set up this meeting, either during office hours or by appointment outside of office hours.

First Draft (5 pts): Two weeks before the end of the semester, students will turn in a first draft of the paper. This draft is an opportunity for students to receive detailed feedback from me and will not be graded in terms of quality. Students are encouraged, but not required, to meet with me after receiving comments on the first draft of their paper.

Presentation (10pts): The last week of classes will be dedicated to student presentations. Students will be expected to give short (5-10 mins) presentation on their final papers. Students should present the thesis of their paper and give a brief defense of it. These presentations will be graded in terms of the presentation itself as well as participation during other student's presentations.

Final Draft (75pts): The final draft of the paper will be due at the final exam period. I will distribute a rubric detailing how the final draft will be graded when I hand back comments on the first draft.

Grading. Overall grades for the course will be determined in the following way:

Final Paper: 40%

Summary Papers: 20%

Midterm Exam: 15%

Final Exam: 15%

Participation: 10%

The grading scale is as follows:

A 94+	A- 90-93	B+ 87-89
B 83-86	B- 80-82	C+ 77-79
C 73-76	C- 70-72	D 60-69
F 59-		

Attendance and Classroom Policies. Attendance is mandatory and will factor into the participation grade. A large portion of each class will be discussion and so to better the environment for discussion I ask that you do not bring any laptops or technology to class. Each student is expected to be an active participant in discussion.

Academic Integrity. Each student is expected to complete their own work for each of the assignments listed above. Any instances of plagiarism will be taken seriously and appropriate action will be taken in accordance with the academic honor code. More information about this honor code can be found at the following website: <https://honorcode.nd.edu/> If you have any questions or concerns about the honor code, you should talk to me.

Tentative Schedule of Readings

Introduction Mathematical Practice	
Week 1	Gold - "What is Philosophy of Mathematics, and What Should it Be?" Hersch - "Some Proposals for Reviving the Philosophy of Mathematics"
Week 2	Thurston - "Proof and Progress in Mathematics" Carter - "Philosophy of Mathematical Practice"
Proof	
Week 3	Dawson - <i>Why Prove it Again?</i> , Chapter 2 Lakatos - "What Does a Mathematical Proof Prove?"
Week 4	Detlefsen - "Proof: Its Nature and Significance" Avigad - "Understanding Proofs"
Explanation	
Week 5	Mancosu - "Mathematical Explanation: Why it Matters" Kitcher - "Explanatory Unification"
Week 6	Steiner - "Mathematical Explanation" Lange - "Aspects of Mathematical Explanation: Symmetry, Unity, and Salience"
Week 7	Baker - "Mathematical Accidents and the End of Explanation"
Midterm Exam	
Diagrammatic and Visual Reasoning	
Week 8	Giaquinto - "Visualizing in Mathematics" Manders - "Diagram-Based Euclidean Practice"
Week 9	Semester Break
Week 10	Carter - "Exploring the fruitfulness of diagrams in mathematics" De Toffoli & Giardino - "Forms and Roles of Diagrams in Knot Theory"
Mathematical Cultures	
Week 11	Jeremy Gray - "Modern Mathematics as a Cultural Phenomenon" Wilder - "The Cultural Basis of Mathematics"
Week 12	Ferreirós - <i>Mathematical Knowledge and the Interplay of Practices</i> , Chapter 2 Rabouin - "Styles of Mathematical practice"
Beauty in Mathematics	
Week 13	Rota - "The Phenomenology of Mathematical Beauty" Cellucci - "Mathematical Beauty, Understanding, and Discovery"
Week 14	Reber - "Beauty and Truth in Mathematics" Rieger - "The Beautiful Art of Mathematics"
Week 15	Student Presentations
Finals Week	Final Exam and Final Paper due