

METHODS OF REASONING

Methods of Reasoning (200 level). .

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Office Hours: Tuesday 3:00pm-4:00pm, Friday 11:00am-12:00pm, or by appointment.

COURSE OVERVIEW

Arguably the most important philosophical skill is the ability to reason and formulate arguments. Sound arguments and good reasoning methods allow us to effectively search for the truth of any philosophical question. In this class, we will consider the reasoning methods used in everyday language, mathematics, and the sciences. We will consider how successful these methods are and how they are able to produce knowledge and understanding. We will discuss the difference between inductive and deductive reasoning, common argument forms, how rigor and intuition play a role in mathematical proof, the aim of the sciences, and common methods for prediction and experimentation in the sciences.

By the end of the course students will:

- have knowledge of what constitutes a good argument and will be able to identify good arguments.
- have knowledge of what reasoning methods play a role in gaining knowledge and understanding in mathematics and the sciences.
- be able to contribute to rigorous philosophical discussion and clearly present philosophical ideas in written form.

Texts. The course will not rely on a single text. The readings for the course will be a mixture of book chapters and journal articles. Some books that we will read from multiple times throughout the course are:

- (1) Alan Hausman, Howard Kahane, & Paul Tidman, (2010) *Logic and Philosophy: A Modern Introduction*, 11th edition.
- (2) Angela Potochnik, Cory Wright, & Matteo Colombo, (2019) *Recipes for Science: An Introduction to Scientific Methods and Reasoning*, 1st edition.
- (3) David Papineau, (2012) *Philosophical Devices: Proofs, Probabilities, Possibilities, and Sets*.

Assignments

Paper/Project. For each section students will have to turn in a paper or project assignment. At the beginning of each section I will distribute a list of prompts for this paper or project assignment and students will choose a prompt and complete it within one week after the section concludes. The due dates for these paper/project assignments can be found in the tentative schedule of readings. The goal of this assignment is for students to extend their thinking about the course material past class discussion. Paper or project prompts will ask students to develop their own thoughts about the topics we discussed in the section.

Quizzes. There will be three quizzes throughout the course of the semester, one at the end of each section. The quizzes will be a mix of true/false, short answer, and essay questions. Study guides will be distributed a week prior to each quiz.

Guided Reading Questions. For each assigned reading, I will post Guided Reading Questions. These questions are for your reference to help you understand and work through the readings. The goal of the Guided Reading Questions is to help students develop their independent learning skills, in particular, their reading and comprehension skills. The questions will help students to extract the main theses and arguments of the philosophical papers we read.

Participation. This course will be partially discussion based so participation and attendance are very important. Attendance is mandatory and students are expected to share their cameras throughout the class when attending via zoom. All students will begin with a participation grade of 100%. Students will lose participation points for the following reasons:

- Unexcused absence: -5 points
- Continual Tardiness: -3 points
- Failure to answer Poll Everywhere: -2 points
- Failure to share camera when attending via zoom: -3 points

Additionally, I reserve the right to deduct participation points throughout the course of the semester as I see fit.

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

Papers/Projects: 35%

Quizzes: 45%

Participation: 20%

The grading scale is as follows:

| | | |
|----------------|-----------------|-----------------|
| A 95+ | A- 90-94 | 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 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 Course Schedule

| Week | Topic | Reading |
|---|------------------------------------|--|
| Feb 3rd | Introduction to the Course | no reading |
| Section I: Logic and Language | | |
| Feb 8th | Arguments | <i>Logic and Philosophy</i> , ch 1 |
| Feb 10th | And | <i>Logic and Philosophy</i> , ch 2 excerpt |
| Feb 15th | Or/Negation | <i>Logic and Philosophy</i> , ch 2 excerpt |
| Feb 17th | Conditionals | <i>Logic and Philosophy</i> , ch 2 excerpt |
| Feb 22nd | Material v Indicative Conditionals | Woods: "The Varieties of Conditionals" Edgington: "On Conditionals" excerpt |
| Feb 24th | Logic and Language | Grice: "Logic and Conversation" |
| March 1st | Modal Notions | Papineau: <i>Philosophical Devices</i> , ch 5 |
| March 3rd | Fallacies | Weston: <i>A Rulebook for Arguments</i> |
| March 8th | Section I Quiz | |
| Section II: Mathematical Reasoning | | |
| March 10th | Mathematical Proof | Dawson: <i>Why Prove it Again?</i> , ch 1&2 |
| March 15th | Computer Based Proof | Brown: <i>Philosophy of Mathematics</i> , ch 10 Section I Project Due |
| March 17th | Mathematical Progress | Thurston: "Proof and Progress" |
| March 22nd | Explanation | Mancosu: "Mathematical Explanation" |
| March 24th | Visualization | Giaquinto: "Visualizing in Mathematics" |
| March 29th | Diagrammatic Reasoning | Azzouni: "That we see that some diagrammatic proofs as perfectly rigorous" |
| March 31st | Infinity | Papineau: <i>Philosophical Devices</i> , ch 2 |
| April 5th | Mathematics and Art | Rieger: "The Beautiful Art of Mathematics" |
| April 7th | Section II Quiz | |
| Section III: Scientific Reasoning | | |
| April 12th | The Aims of the Sciences | <i>Recipes for Science</i> , ch 1 |
| April 14th | Experimentation:Method | <i>Recipes for Science</i> , ch 2 Steinlie: "Experiments in History and Philosophy of Science" Section II Project Due |
| April 19th | Modeling | <i>Recipes for Science</i> , ch 3 |
| April 21st | No Class | no readings |
| April 26th | Probabilistic Methods | <i>Recipes for Science</i> , ch 5 |
| April 28th | Causation | <i>Recipes for Science</i> , ch 7 |
| May 3rd | Explanation and Theory Choice | <i>Recipes for Science</i> , ch 8 |
| May 5th | Mathematical Applications | Wigner: "The Unreasonable Effectiveness of Mathematics" |
| May 10th | Section III Quiz | |
| May 17th | Finals Week | Section III Project Due |