**Philosophy Minor Suggestions for Math Majors**

**Faculty Profiles for Featured Science/Math related Courses**

* **Prof. Paul Audi** (B.A., Philosophy, Colgate; Ph.D., Philosophy, Princeton) Areas: Metaphysics, Philosophy of Mind, Logic, Epistemology, Philosophy of Science & Mathematics, Philosophy of Religion. Sample Publication: "Why Truthmaking Is Not a Case of Grounding," *Philosophy and Phenomenological Research* 101(3) (2020): 567-590. <https://onlinelibrary.wiley.com/doi/abs/10.1111/phpr.12605>

Webpage**:** <http://www.paulaudi.net/>

* **Prof. Jens Kipper** (M.A. Philosophy, Univ. of Bonn; Ph.D., Philosophy, Univ. of Cologne) Areas: Philosophy of Mind & Artificial Intelligence, Philosophy of Language, Epistemology, Applied Ethics, Philosophy of Science. Sample Publication: “Intuition, Intelligence, and Data Compression,” *Synthese* (2019). <https://doi.org/10.1007/s11229-019-02118-8> Webpage: <https://philpeople.org/profiles/jens-kipper>
* **Prof. Jon Herington** (B.A./B.Sc. in Philosophy and Microbiology, B.A. in International Relations, University of Queensland; Ph.D. in Philosophy, Australian National University) Areas: Data Ethics, Ethics of Science & Technology, Health Security, Political Philosophy. Sample Publication: “Measuring the Biases that Matter: Ethical and Causal Foundations of Measures of Algorithmic Fairness” (w/ B. Glymour)  
  *Proceedings of the ACM Conference on Fairness, Accountability and Transparency’ 19* (Jan 2019): 269–278. <https://dl.acm.org/doi/10.1145/3287560.3287573> Webpage: [www.jherington.com](http://www.jherington.com)

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| * **Prof. Alison Peterman** (B.S. in Philosophy, Univ. of Richmond; M.S. in Physics, Univ. of Maryland; Ph.D. in Philosophy, Northwestern) Areas: Early Modern Philosophy, History of Philosophy of Science, Metaphysics, Philosophy of Perception, Philosophy of Science. Sample Publication: ["Empress vs. Spiderman: Margaret Cavendish on pure and applied mathematics."](https://link.springer.com/article/10.1007/s11229-017-1504-y) *Synthese*. [(preprint)](https://www.rochester.edu/college/faculty/alisonpeterman/SpiderMan.pdf) Webpage: <https://www.rochester.edu/college/faculty/alisonpeterman/> |

* **Prof. Mark Povich** (B.A. in Philosophy, Ph.D. in Philosophy-Neuroscience-Psychology, Washington University in St. Louis) Areas: Philosophy of Science, Philosophy of Psychology, Philosophy of Neuroscience, Philosophy of Mathematics, Philosophy of Mind. Sample Publication: “The Narrow Ontic Counterfactual Account of Distinctively Mathematical Explanation,” *British Journal for the Philosophy of Science,* <https://doi.org/10.1093/bjps/axz008> Webpage: <http://www.sas.rochester.edu/phl/people/faculty/povich_mark/index.html>
* **Prof. Zeynep Soysal** (B.A. in Mathematics & Philosophy, Cornell; Ph.D. in Philosophy, Harvard) Areas: Philosophy of Language; Philosophy of Mathematics; Epistemology; Metaphysics; Logic and Set Theory; Early Modern Philosophy. Sample Publication: [“Why is the Universe of Sets Not a Set?”](https://link.springer.com/epdf/10.1007/s11229-017-1513-x?author_access_token=mK9fttXo0cKSHXxarot-iPe4RwlQNchNByi7wbcMAY4WlbySnVvIfUXJOyawl0DvtPIbcE5n78oOp3uTYQMp4MOjWO3_-0K-ARID9FrKA1bIFVzYztoRocl0WImqRN6IFjLK5U-G8XpftRuAvCm-zg%3D%3D) *Synthese* 197 (2020): 575-597. Webpage: [www.zeynepsoysal.com](http://www.zeynepsoysal.com)

**Featured Course Descriptions**

* **PHIL 152: Science and Reason**

This is a first course in understanding the methodologies and styles of reasoning employed in the sciences. The course will provide insight into testing of theoretical hypotheses as well as inductive and probabilistic reasoning and their applications in science and ordinary decision-making. We will devote considerable time to case studies in the history of science as well as contemporary issues. The goal of the course is to develop a useful understanding of how to distinguish respectable scientific inquiry from less scientific and often disreputable uses and abuses of this methodology.

* **PHIL 202: History of Modern Philosophy**

This course covers selected philosophical topics and philosophers from the late 16th century through the 18th century. It focuses on philosophy in Europe but includes some work by philosophers from Africa and China. This period is very rich in wonderful philosophy, much of it in dialogue with what we would now call the natural sciences, but which were, at that time, perfectly continuous with what we now call philosophical inquiry. We will study the ingenious, surprising, beautiful and influential questions and theories of a number of thinkers from this period, including Rene ́ Descartes, Sor Juana de la Cruz, Anton Wilhelm Amo, David Hume, Mary Shepherd, and Margaret Cavendish. We will think with them and others about the sources of knowledge, the nature and epistemological role of perception, the relationship between the mind and the body, matter and motion, and the existence and significance of God.

* **PHIL 212**: **Probability, Inference & Decision**

Over the past 50 years, many fields - including philosophy, economics, and cognitive science - have taken a “probabilistic turn”, characterizing inference and rationality in probabilistic terms. This course will investigate the logic and metaphysics of probability and its applications to various philosophical and scientific problems. The first section of the course will provide students with an introduction to the probability axioms and the basics of uncertain inference. The second section will explore how philosophers and economists have proposed that we use these axioms to provide constraints on rational belief and decision-making. In the third section, we will examine the metaphysics of probability, asking such questions as: what does it mean to say that the chance that it will rain tomorrow is .6, and are there genuine probabilities if the world is deterministic? We will conclude by investigating how probabilities are used in scientific inference. This course will not require math beyond simple algebra.

* **PHIL** **214**: **Logical Methods in Philosophy**

The tools of formal logic and set theory most widely used in contemporary philosophical analysis, such as modal propositional logic and applications: logics of necessity and possibility, tense logic, the logic of counterfactuals, modal predicate logic.

* **PHIL 215/MATH 225**: **Intermediate Logic**

This course is an introduction to metalogic. Topics covered include basic elements of set theory, and the model-theoretic treatment of sentential and first-order logic (completeness, compactness, and Löwenheim-Skolem theorems).

* **PHIL 216/MATH 216: Mathematical Logic**

This course will cover three philosophically important results of modern logic: Gödel’s incompleteness theorems, Turing’s definition of computability, and Tarski’s theory of truth for formalized languages. We will discuss both the mathematical content and the philosophical significance of these results.

* **PHIL 218**: **Philosophy of Mathematics**

This course is a general survey of the philosophy of mathematics. Historically, philosophers of mathematics have concerned themselves with at least two different (though related) kinds of questions: How does mathematics, as mathematicians practice it, fit into our broader philosophical picture of the world? and How should mathematics be practiced? The latter question was investigated in depth during the so-called “three schools” period in the first half of the twentieth century (the three schools being *logicism*, *intuitionism*, and *formalism*). The “three schools” period saw a remarkable amount of interaction between philosophy and mathematics, as well as the development of a new field—modern logic—by philosophers and mathematicians of the time. At the end of this era, which roughly coincides with Kurt Gödel’s incompleteness theorems, philosophers of mathematics turned primarily (though not exclusively) to the first kind of question. In outline, answering this question involves understanding the working and nature of mathematical knowledge, objects, language, and thought, and understanding how these fit (or whether they fit) with more general views in epistemology, metaphysics, philosophy of language, and philosophy of mind.

In this course, we will study both kinds of questions. The earlier parts of the course will focus on historical texts from the “three schools” period. In the later parts of the course, we will focus on a few important contemporary philosophical programs about the metaphysics and epistemology of mathematics, such as nominalism, structuralism, and naturalism.

* **PHIL 235**: **Data, Algorithms & Justice** This course focuses on questions that arise in the design, development and deployment of machine learning algorithms. Topics include: Bias in algorithms (e.g., how should we measure unfairness in algorithms that determine who gets bail, parole, a job, or a loan? What about bias in health analytics?) Values disagreement and algorithms (e.g., how should self-driving cars or diagnostic algorithms make decisions, given that we disagree about the good?) Algorithms, social media, and public life (e.g., what is the impact of social media algorithms on public discourse and the future of democracy?) Algorithms and the future of work (e.g., how should we structure our society when many basic tasks will be performed by machines? How should we distribute the benefits of machine productivity?)
* **PHIL 242**: **Metaphysics**

Metaphysics is roughly the philosophical study of what things exist, what they’re like, and how they fit together.  For example, we might ask whether tables exist as something over and above their atomic parts.  More generally, if we have six things stuck together, do we thereby have a seventh, the composite object?  Sample topics include these and other questions about the nature of objects, and also questions about properties, relations, causation, space, time (and spacetime), change, laws of nature, the status of abstract entities (like numbers and sets), and bigger-picture questions like the mind-body problem or the free will problem.

* **PHIL 246: Social Character of Knowledge**

It is hard to overstate how much we rely on others in acquiring knowledge (for better or worse). In this course, we elucidate the many forms this reliance takes. We investigate how knowledge is distributed in the scientific community and elsewhere, including in society as a whole, and how information and misinformation spread in these communities. We also identify potential flaws in the existing structures in which knowledge is distributed and disseminated, and try to find ways in which these structures could be improved. In addressing these questions, we draw on formal tools provided by Bayesian epistemology.

* **PHIL 247**: **Philosophy of Language**

This course explores the general structure, uses, and mechanisms of language. A focus of our discussion is on the use of possible-worlds semantics in modeling meaning. In the second part of our course, we apply these formal models, among others, to social issues concerning communication, speech acts, and propaganda.

* **PHIL 252**: **Philosophy of Science**

A survey of metaphysical and epistemological questions about science: Must the entities posited by a scientific theory exist for it to be successful? Do laws of nature govern the world or simply articulate patterns? How are theories and evidence related to one another, and how are lower and higher level scientific theories related to one another? Is scientific explanation primarily concerned with laws, with causes, or with something else?

* **PHIL 257**: **Philosophy of Artificial Intelligence**

Many people believe that very soon, artificial intelligence is going to be everywhere. Artificial systems will steer cars, ships, and planes, care for the sick, fight fires and fight wars for us, organize our schedules, order our food, etc. But what exactly is an artificial intelligence? And can there be artificial systems that truly think, or feel? In this course, we will address questions like these from a philosophical perspective. In doing so, we will encounter some of the most fundamental issues in the philosophy of mind—for example, what are thoughts and feelings, and how might they relate to physical states of our brains, or to computational states? We will then examine how artificial systems, such as artificial neural networks, function, and discuss what they might teach us about the mind in general and about human minds in particular. In the final third of the course, we will consider the consequences that the development and application of artificial intelligence might have for humanity.

**For more information about Philosophy program requirements, faculty, and opportunities, see:** [**https://www.sas.rochester.edu/phl/undergraduate/index.html**](https://www.sas.rochester.edu/phl/undergraduate/index.html)

**Or contact**:

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